



SATURDAY, SEPTEMBER 16, 1871.

Eyth's Patent Valve Gear.

Some of Messrs. John Fowler & Co.'s engines at the Wolverhampton Exhibition were provided with a new reversing gear of a remarkably simple description, of which, as applied to double-cylinder engines, we give some detailed drawings.

Fig. 1 represents a part plan of an engine placed in the ordinary manner on the top of a boiler; fig. 2 is a cross section through the crank shaft; fig. 3 a longitudinal section through the same, as also fig. 4, which shows part of the reversing gear at right angles to the position illustrated in fig. 3.

As will be seen, a single tumbler or eccentric, *B*, and a pair of eccentric straps, *A*, move the eccentric rod *I*, of the further cylinder. The tumbler, instead of being keyed to the crank-shaft in the ordinary manner, is perforated by a large slanting hole, through which passes a cast-iron cylindrical body, the reversing cylinder, *C*. This again is bored out to the diameter of the crank-shaft, and, being movable in a longitudinal direction along the crank-shaft, is held in its position by means of a ring, *D*, bolted to its side, a strap, *E*, and a forked handle, *F*.

Now the reversing cylinder is split in two pieces, which are held together by two bolts, *S*, leaving a space of about $\frac{3}{4}$ inch between the two halves parallel to the axis of the crank-shaft. A key, *R*, passes through this space and the middle of the crank-shaft, its two ends being held by the eccentric tumbler, *B*. This key, following the movement of the tumbler during the process of reversing, slides readily through the hole in the crank-shaft. Still it prevents the tumbler from sliding sideways, and gives to the whole system its turning motion when the crank-shaft revolves.

The eccentric rod, *I*, is connected to the eccentric strap by a joint. A prolongation or short arm cast to the strap at right angles to the first eccentric rod acts on the rocking lever, *G*, whose vertical arm works the eccentric rod, *J*, of the nearer cylinder.

The outside surface of the reversing cylinder, *C*, is turned on the lathe, and *M N* (figs. 2 and 4) is the center block line, *M* and *N* being the two extreme positions of the centers of the forward and backward eccentrics, supposing two eccentrics as being used. The axis of the hole through the reversing cylinder corresponds with the center line of the crank-shaft. By sliding, therefore, the reversing cylinder along the line of the crank-shaft, it moves the center of the eccentric *B* in a straight line from *M* to *N* (fig. 2). Thus a constant lead of the valve is maintained, and its movement, during reversing, is similar to that which takes place in case of the ordinary link motion.

It is further evident that, the two cranks being at right angles, a point of the eccentric straps at right angles to the point which works the valve of one cylinder will give a correct movement to the valve of the second cylinder. Thus, by a simple bell-crank, as above described, the movement of the second valve is obtained.

In principle it will be seen this valve gear is identical with the old arrangement known as Dodd's wedge motion. The novelty consists in the substitution in a simple cylindrical body for the wedges and inclined planes. This simplifies the manufacture of the parts greatly, inasmuch as everything can be done on the lathe and boring machine. The employment of a bell-crank for the purpose described is, we believe, also new in connection with this class of valve motion.

In comparison with the link motion the described arrangement offers the advantages of fewer parts, greater simplicity and cheapness, but especially a considerable reduction in the number of wearing parts and rocking centers, one eccentric and six rocking centers doing duty for four eccentrics and fourteen wearing surfaces in the ordinary link motion.—*The Engineer*.

—W. G. Lapham, Assistant Superintendent of the New York Central & Hudson River Railroad, has been appointed Consulting Engineer of the Cayuga Lake Railroad connecting Cayuga with Ithaca.

Bauschinger's Indicator Experiments on Locomotives.

(Continued from page 259.)

(b) *Admission*.—The admission of steam into the cylinder depends, of course, in the first place upon the amount of regulator opening. We have, in Table III., on page 238 of the present volume of the RAILROAD GAZETTE, given the relative areas of these openings, and referring to the indicator curves published on pages 239 and 240, it will be noticed that where the diagram was taken with the regulator practically open, the piston obtained nearly the full boiler pressure at the very commencement of the stroke. That this condition is more a question of lead than of anything else will be manifest by a glance at diagrams Nos. 8 and 9, engine (A), taken at the 2nd and 6th notch respectively. In the former case—the engine running near mid-gear—the lead amounts to 2.3 per cent. of the piston area, and, as shown by the diagram, the initial cylinder pressure was 98 per cent. of the pressure in the boiler; while in diagram No. 9, taken with a lead of but 1.6 per cent. of the piston area, the maximum cylinder pressure reached but 90 per cent. of the boiler pressure, notwithstanding the slower speed of the engine.

An important consideration in connection with the admission of steam is that the maximum cylinder pressure be fully maintained until the closing of the valve;

valve motion, having less angular advance of the eccentric and less lap of the valve, opens the port both more widely and quickly than the shifting-link motion, and owing to this circumstance the initial cylinder pressure is fully maintained during the period of admission, for all degrees of expansion, as demonstrated by the indicator curves taken from engine (G). On the other hand, the same curves indicate a striking discrepancy between the boiler pressure and that obtained in the cylinder, but in this respect the diagrams under notice can hardly furnish conclusive evidence, since they were in most cases not taken with the full regulator opening; in this case, also, the pre-admission does not begin before the piston has reached the end of its stroke, a fact which is certainly very objectionable, even taking into account the slow working speeds of engine (G). In alluding to this fault of construction, we may just offer the general remark that we by no means approve of some of the proportions contained in Tables I., II. and III. (vide pages 218 and 238 of this volume respectively), which refer to the engines experimented upon by the learned professor. The Meyer motion, however, can be so proportioned as to offer the two desirable elements of a good admission, viz., attainment of the boiler pressure and the maintaining of this pressure during the period of admission; and Professor Bauschinger has in fact obtained some diagrams

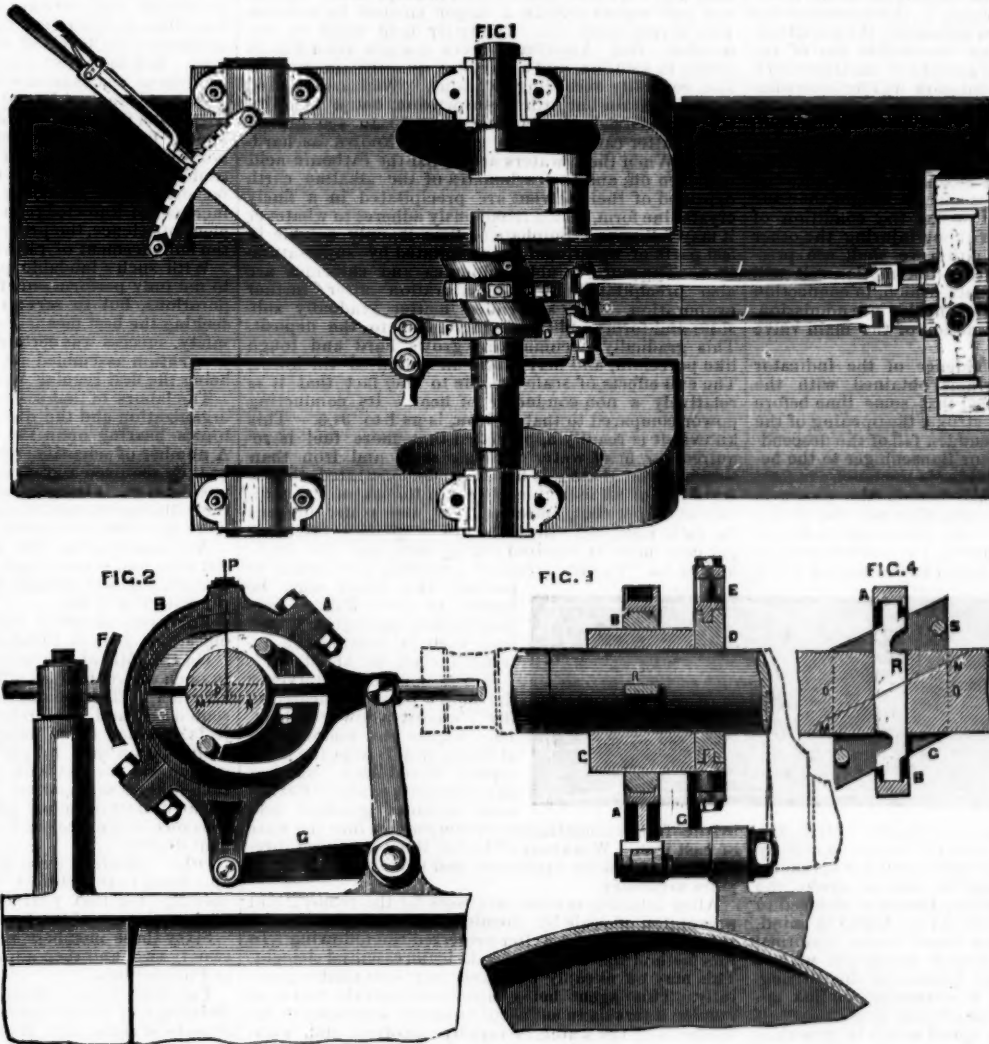
(at speeds above 100 revolutions per minute) from engine (E) which support our statement.

We have already seen that in the case of the shifting link motion the early pre-admission of live steam from the boiler and the amount of compressed steam tend to raise the cylinder pressure—at the very commencement of the stroke—within close approach of the boiler steam-gauge, but with the ordinary slide valve this pressure can only be maintained at very slow speeds. If the engine is making 100 revolutions per minute, the valve is unable to keep up the supply for any rate of expansion, and the steam line of the indicator curve begins to fall directly from the maximum cylinder pressure to the point of cut-off. In this respect the curves obtained from engines A and B, fitted with the double admission valve, compare very favorably with those of engines C and D, having the ordinary slide valve; the great advantages of the former valve being apparent even at the slow speeds at which goods trains generally run.

That the maximum steam pressure obtained in the cylinder at the commencement of the stroke should remain as constant as possible during the period of admission, is very desirable, and we consider this property of the Meyer double valve motion practically of much more importance than any advantages which are often ascribed to this motion on account of the small compression. With the Stephenson link motion the same aim may be reached—

and has already been reached in many cases—by the employment of the Trick or Allen valve with the auxiliary steam passage, and we certainly expect to find this simple and effective valve become in future more generally adopted.

(c) *Pre-release and release*.—To provide a rapid egress for the steam, and in order that its pressure may be as nearly as possible at minimum, after the work in the cylinder has been performed, it is necessary that the exhaust port should be opened before the piston reaches the end of its stroke. The proper amount of this pre-release depends, of course, upon the velocity of the piston and the quantity of steam to be discharged, or the degree of expansion. If, on the contrary, the steam be confined till the last instant, the back pressure at the commencement of the return stroke will be considerably increased, in proportion to the period of admission. The deficiency of pre-release produces in the indicator curves a sharp corner at the end of the stroke, as shown by the curves obtained with the Meyer motion (engine G); referring to diagrams Nos. 17 to 19 of the series, on pages 239 and 240 of the present volume, it will be noticed, also, that a considerable loss of effective pressure is caused for the same reason, as clearly shown by the area cut off from the indicator diagrams. Judging from indicator experiments on stationary engines, it would appear that in that case a pre-release equal to one-third of the port is sufficient. Referring now to Table No. II., on page 218, which records the amount and the beginning of the pre-release for the four Meyer valve gears, it will be seen that its highest value, for engines E, F, and G, is but one-fourth of the port, an amount much too small, particularly when the higher working speed of locomotives, as compared with



in other words, that the steam line of the curve traced by the indicator should, as much as possible, run in a horizontal direction. To effect this it is necessary to have the port fully uncovered early in the stroke, so that the steam can be rapidly introduced into the cylinder. Referring to diagrams taken from engine A. at the 4th, 6th and 8th notch, we find that the steam line is kept well up to the boiler pressure, and this pressure is nearly fully maintained until the point of cut-off is reached. If we take into consideration the small amount of lead obtained in these cases, we must attribute the comparatively good results solely to the employment of the Trick or Allen valve, the auxiliary steam passage of which permits—with a smaller amount of angular advance of the eccentric—a very rapid and good introduction of steam.

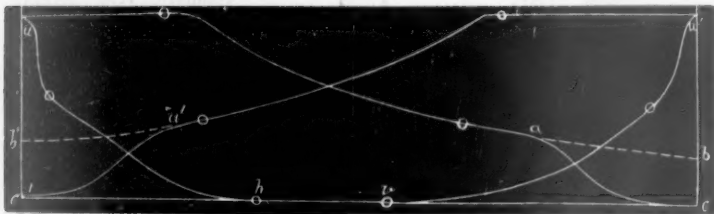
In diagrams taken with a high rate of expansion, and more particularly at high speeds, the steam line generally falls more or less during the period of admission, indicating that the port opening is insufficient. Diagram No. 1, on page 239, illustrates a case of this kind, taken from the 1st notch of engine (A), while the engine was making 144 revolutions per minute. Although here the initial pressure attained nearly the boiler pressure, yet the quantity of steam admitted was not sufficient to maintain that pressure, even for part of the stroke; in other words, the steam is said to be wire drawn or throttled.

The form of the steam line of the indicator curve depends, however, not only upon the more or less rapid opening of the steam port, but also on the maximum length to which the port is opened. Comparing the distribution diagrams on page 239, of the two different valve gears, it will be noticed that the Meyer double

stationary engines, is taken into consideration. The amount of back pressure against the piston during the remainder of the exhaust, also, depends directly upon the amount of pre-release and, indirectly, upon the speed of the engine. If the exhaust port is not well open at the end of the stroke, it is evident that the greater bulk of the steam must be discharged during the return stroke of the piston until the closing of the exhaust port; but as the piston attains its maximum velocity at half stroke, the minimum back pressure above the atmospheric line must then be greater than it would be under the more favorable condition of premature escape of steam. Thus, defective pre-release involves not only a direct loss of the work done by the steam, as shown by the corner cut off from the indicator diagrams Nos. 17 to 19, but its injurious effect is also manifest during the greater part of the return stroke.

The condition of ample premature release of the steam can be satisfied in two different ways, first by a diminution or, eventually, by an entire abolition of inside lap (as will be noticed by our illustrations on page 238, the valves of the locomotives of the Bavarian State railways are all furnished with with considerable lap on the exhaust side); second, by increasing the lead of the eccentrics and the outside lap of the valve. Professor Bauschinger is of opinion that, if necessary, the latter expedient should be employed, as the abolition of inside lap would diminish, at the same time, the compression, and thus injure, indirectly, the pre-admission of steam. By increasing the outside lap of the valve, on the other hand, the amount of maximum cylinder pressure during the admission will be somewhat prejudiced, but this loss will be more than compensated by the positive advantage of a free release and the freedom from back pressure; moreover, the consequent loss of pressure constitutes a lesser economical disadvantage since the quantity of steam admitted into the cylinder is, of course, of a less specific weight than the steam at boiler pressure. How far the condition of free release can be attained without injuring the other elements of the steam distribution we shall see presently by examining the shifting-link motion; it will then be possible to arrive at data, which, in connection with our former observations on the pre-admission, will lead to the proper construction of the main valve of Meyer's motion.

If we now consider the evidence of the indicator with reference to the diagrams obtained with the shifting link, it will be noticed that some time before the piston has performed its stroke, the opening of the exhaust port is marked by a sudden fall of the descending curve. This leads Professor Bauschinger to the belief that the amount of pre-release is too much; in fact, the loss of effective pressure behind the piston is nearly equivalent to the corresponding gain due to the reduction of pressure before the piston on its return stroke. A striking illustration of this phenomenon is afforded by annexed diagram, taken in the second notch



of engine B, while running into a station. Here, the loss of work done, by the steam, is clearly shown by the areas, *a b c*, and, *a' b' c'*, cut off from the diagram by premature release; but during the return stroke, the back pressure against the piston becomes reduced to that of the atmosphere. It should be borne in mind, however, that this curve was taken under abnormal circumstances, viz., at a very slow speed, yet with a short cut-off. It is a marked feature of the shifting-link motion that the release increases as the link approaches mid gear, and this condition is necessary if the engine be run at a high speed which is generally

Class of Engine.	Notch.	Pre-release in per cent. of piston area.		Per cent. of stroke to be completed when pre-release commences.		Opening of exhaust port at end of stroke in per cent. of port area.	
		Hind end.	Front end.	Hind end.	Front end.	Hind end.	Front end.
A.....	8th	8.0	3.6	4	7	44	44
	2nd	4.5	4.5	20	25	55	55
B.....	8th	4.8	4.5	5	7	56	56
	2nd	5.9	5.9	25	35	73	73
C.....	8th	6.2	6.2	8	11	63	63
	2nd	6.6	6.6	27	35	73	73
D.....	7th	4.3	5.7	5	10	53	75
	2nd	5.3	6.2	23	35	61	77

the case in that position of the reversing lever; at starting, or in mounting a steep incline, on the contrary, a longer period of admission and a smaller amount of pre-release are usually employed. The influence of the element of speed is also clearly shown in the indicator diagrams. With increasing speed, the irregularities of the descending curve of the diagram become less apparent, and the change of the expansion line into that of the escape is much less distinct than at slow speeds.

But in order to appreciate the full importance of pre-release we should, at the same time, ascertain its influence upon the back-pressure line of the diagram. In this respect the indicator curves, taken from the various engines with the Stephenson link motion, furnish ample evidence to show that in the same measure as a free escape for the steam is provided for at the beginning of

the return stroke, the back-pressure becomes reduced during the remainder of the exhaust. As we have not considered it necessary to reproduce all the curves collected by the experimenters, we give in the preceding table some data respecting the pre-release of the different engines.—*Engineering.*

(TO BE CONTINUED.)

Steam Boiler Waters and Incrustation.

Dr. Joseph G. Rogers, of Madison, Indiana, in a paper on steam boiler water and incrustation, before the American Association for the Advancement of Science, said that practical men have always felt the need for scientific information on this important subject. They have made innumerable attempts to overcome difficulties attending the use of hard water, yet so crude and superficial have they been that but little success has been attained. What follows is a brief *resumé* of the various proposed methods together with some investigations of my own:

All natural waters contain in solution or suspension more or less mineral matter and vegetable matter. This consists principally of the carbonates of lime, magnesia and iron (held in solution by free carbonic acid), sulphates of lime and magnesia, chlorides of calcium, sodium and magnesium, and undissolved carbonates, clay, sand and vegetable matter, held in suspension. Spring and well waters contain a larger amount in solution than rivers, lakes, etc. The latter hold more in suspension. Our American rivers contain from 2 to 10 grains in solution, and a varying quantity in suspension generally exceeding 10 grains. Well and spring waters contain but little in suspension, but a quantity of the dissolved salts varying from 10 to 650 grains. These latter cause what is generally known as hardness. When these waters are boiled the carbonic acid is driven off, and the carbonates of the alkaline earth deprived of their solvent are precipitated in a finely crystalline form, which tenaciously adheres to whatever it may fall upon. Sulphate of lime is only soluble in 500 parts of water, and is precipitated by supersaturation. The more soluble sulphates and chlorides are also precipitated by supersaturation after further evaporation. The suspended matter gradually subsides and forms additional increment to the deposit. This gradually accumulating grows hard and tough like porcelain, and may attain an unlimited thickness. The evil effects of scale are due to the fact that it is relatively a non-conductor of heat. Its conducting power compared to that of iron, is as 1 to 87.5. This known, it is readily appreciated that more fuel is required to heat water through scale and iron than through iron alone. It has been demonstrated that a scale 1-16 of an inch thick requires the extra expenditure of 15 per cent. more fuel. As the scale thickens the ratio increases—thus when it is $\frac{1}{4}$ inch thick, 60 per cent. more is required; at $\frac{1}{2}$ inch, 150 per cent., and so on. To raise steam to a working pressure of 90 pounds, the water must be heated to 320° Fahr. This may be done through a $\frac{1}{4}$ inch iron shell by heating the external surface to about 325°.

If a $\frac{1}{2}$ inch scale intervenes the boiler must be heated to 700°, almost a low red heat. The higher the temperature at which iron is kept the more rapidly it oxidizes, and at any temperature above 600° it soon becomes granular and brittle from carbonization or conversion into the state of cast iron. Weakness of boiler thus produced predisposes to sudden explosions and makes expensive repairs necessary.

After detailing several processes for the removal and prevention of scale by chemical means operating inside the boilers, the writer preferred the following: In this method the tannate of soda is the essential element. This may be cheaply prepared, and is attainable generally. This agent being introduced into the boiler at regular intervals in sufficient quantity, according to the hardness of the water, is rapidly dissolved, and, without foaming or action on the iron, completely does the desired work. The reaction is as follows: The tannic acid leaves the soda and combines with the lime of the carbonates to form tannate of lime, which is precipitated in a light, flocculent, amorphous form, which does not subside in the boiler at all, but floats in the currents of ebullition, till it finds its way to the mud-receiver, where, as there is little or no current, it is deposited as a mushy sediment, which may be readily blown out from time to time. The sulphate of lime is decomposed by the carbonate of soda formed by the first reaction, soluble sulphate of soda and carbonate of lime being formed. The latter is converted into tannate of lime by fresh portions of the tannate of soda. The pre-existing scale is more slowly disintegrated, and the resulting tannate of lime voided as before described. The presence of the alkali prevents all action of the acid on the iron. Extensive practical trial of this method has demonstrated its utility in all kinds of boilers, and its perfect efficacy, safety, economy, ease of application, and general adaptability, will commend it for general use.

Prof. Vander Weyde mentioned that the New York Central Railroad had caused him to make an analysis of the various waters in use upon the line of their road, with reference to their use in locomotive boilers. He found many waters much worse than others, and recommends that those most objectionable should never be used except in cases of extreme need; and where used he recommended that certain "medicines" should be added to the objectionable waters. The result was exceedingly satisfactory. Mr. Warren suggested the use of superheated steam as a mechanical means for tearing away the incrustations; but admitted that to get the steam superheated, the water would be so heated as to make the deposits.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

Report of the Fourth Annual Convention.

About fifty of the members of the Association assembled Tuesday morning, 10 o'clock, in the reading room of the Galt House, Louisville, pursuant to their last adjournment. We take the following report of the proceedings that day from the *Louisville Ledger*:

Mr. H. M. Britton, President of the Association, called the meeting to order. On motion the reading of the minutes of the last convention was dispensed with. Officers present, besides Mr. Britton, N. E. Chapman, First Vice-President; S. J. Hayes, Treasurer, and L. P. Dodge, Secretary.

Mr. Britton delivered the following address:

MR. BRITTON'S ADDRESS.

GENTLEMEN—Deeply sensible of my inability to say anything at this, the opening of our fourth annual convention, that will be either interesting or profitable, yet I must at least rise and appear before you, out of respect for old time forms and usages. And I have thought that a very brief allusion to the rise and progress of our association would not, perhaps, be inappropriate. Its history is familiar to all; but as I reflect upon the past and consider the present, I find much to encourage. It was a bold undertaking for those few gentlemen that were assembled June 10, 1868, at Dayton, Ohio, to issue a call for a general meeting of master mechanics at Cleveland, Ohio, on September 30, of that year. But the object was not a selfish one; it was in the interest of mechanical science the world over.

The call was not issued that we might in secret concoct plans for the organization of "rings" and "alliances," for the purpose of exacting from railway corporations an increase of salary, or, as in the case of trade-unions, to dictate terms of employment. No; far above such groveling impulses, the object was the increase of knowledge in our profession, the advancement of science, the promotion of friendship, and hence the enhancement of railway interests.

With such a laudable purpose, actuated by a desire to not only perform our full duty to our several corporations, but to serve the traveling public also by seeking the best means conducive to their comfort and safety, success was certain. Agreeable to the call, the convention assembled at Cleveland, September 30, 1868, being the first regular session.

The labors of that session consisted in perfecting the organization and the discussion of several important topics bearing upon the improvement of machinery. A number of scientific questions were presented, but as they required a great deal of research and study to answer them intelligently, it was resolved to postpone their discussion until the next session, and committees were appointed to report thereon in detail.

A committee was also appointed to publish the constitution and proceedings of the Cleveland convention. Sixteen pages in pamphlet form were necessary to comply with this order.

Forty-one members reported, and then adjourned to meet next year at Pittsburgh.

On the 15th of September, 1869, the association met in open convention, as adjourned, at Pittsburgh, Pennsylvania. The committees appointed last year presented full and comprehensive reports upon the subjects assigned them, which brought forth a great deal of discussion and valuable information. The whole session was fraught with zeal, and a desire to emulate each other was apparent.

The utmost harmony prevailed, and the reports, discussions, and exercises were all profitable in an eminent degree.

Other questions were propounded, and committees appointed to report next session. The report of proceedings for that year occupied seventy-eight pages against sixteen of the former year.

Sixty-three members reported, being an increase of twenty-two, and then adjourned to meet in next session at Philadelphia.

The third annual session convened in the Assembly Buildings of Philadelphia, September 14, 1870. The reports of committees, if possible, exceeded those of the previous convention. The minutest detail, containing all the available statistics and information upon the various subjects, was thus brought before the convention for discussion.

The various ideas thus eliminated, together with the reports as published that year in book form of 144 pages, constitute a book full of valuable matter that would do no discredit to the library of the most scientific. It is a book worthy of study; one that to the mechanic is of daily benefit; one that would grace the center table of the parlor of the wealthy scientist, and I, for one, feel proud that it emanated from the American Railway Master Mechanics' Association.

The citizens of Philadelphia seemed to be engaged in an earnest desire to outvie each other in their efforts to render our stay and visit a pleasant one.

Their cordiality and hospitality knew no bounds, which was an additional rivet to our confidence in the value and prosperity of our undertaking.

One hundred and twenty-four members reported and then adjourned to meet in next regular convention in Louisville.

And now, gentlemen, on this, the 12th day of September, 1871, we are again in session, pursuant to adjournment.

I have thus hastily glanced over our progress as a scientific association, and I believe its success is without a parallel. But a little over three years have elapsed since the first idea was conceived, and now we have arisen to an eminence attracting the attention and confidence of all that are connected in any way with the vast railway interests of America. The stockholder looks upon our institution with favor because he sees a desire to add an additional security for the money that he has invested; the President and Superintendent encourage it because they see that we are

thus studying the improvement of machinery, and economy in its working.

The traveler smiles upon our organization because he discovers that speed and safety are sought for; the world at large recognizes us because we are honorable citizens. We have everything to encourage and stimulate us on to good works. From a membership of 41 there is recorded 63, and then 124; from a pamphlet of 16 pages containing a record of proceedings, we have one of 78, and still another of 144.

Besides this increase of members and amount of matter published, scientific information of the greatest value to the mechanic, the railway owner and operator, and the great traveling public, has increased in still greater ratio.

These are but a part of the benefits derived. We have increased in social friendship; a friendly fraternal feeling has been promoted, and as these flourish and grow, elevating the man, they must be productive of a growth in morality.

Being brought nearer and nearer in relation to each other, and familiarized with the habits and customs of all, an instinctive perception of what is right or wrong in moral conduct is aroused.

We are thus brought to criticize each other, to approve some actions and disapprove others, independent of education or the knowledge of any positive rule or law.

The elevation of man in his social, kindred, and moral qualities is one of the many benefits to be derived from our frequent comminglings together.

I have nothing special to recommend, except, perhaps, it may be an interchange of views in relation to the gauge of track. Broad gauges have been narrowed down, and a still narrower gauge has been agitated in the public mind, and an expression from this body of experienced men might perhaps be received with some satisfaction.

The past has been an eventful year of railroad accidents, and great loss of life has been the result; but I am happy to say that in no case has defective machinery been the cause.

Disobeying or misunderstanding of orders has led to this deplorable loss of life, and it behooves master mechanics everywhere, having charge of locomotive engineers, to see that before taking charge of an engine they fully comprehend the running rules. I congratulate you, gentlemen, upon the success of this enterprise, and relying upon the experience of the past, I have the fullest confidence that the benefits to be derived from this, our fourth convention, will be even greater than any that have preceded. Although undeserving your attention to these crude remarks, I thank you for your forbearance, and now commit to you this convention for active business, knowing full well that a recommendation to zeal and harmony is unnecessary.

The President announced that the first business in order was to hear the report of the Treasurer, which was sent to the Secretary's desk and read and ordered to file.

The President announced that he had received quite an amount of correspondence since last adjournment, which should be referred to a special committee, to report what of the same was of sufficient interest to be read.

On motion to that effect, a committee of three was appointed by the chair, to wit: Messrs. Wells, Setchell, and Philbrick.

The report of the

COMMITTEE ON BOILERS AND BOILER EXPLOSIONS

Was read by the Secretary, and was very full of interesting matter, and quite lengthy. S. J. Hayes, of the Illinois Central, chairman of the committee, is a gentleman of scientific attainments, and his opinions have great weight.

His report embraced the experience of several of the leading railways of the country, as to the relative merits of iron, copper, and steel plates, and recommended the use of steel for furnaces, and iron for the shell of boilers. The committee think there would be material advantage in constructing the cylinder parts of boilers of single sheet, provided they could be manufactured with a uniform degree of excellence. Many valuable data were attached to the report in relation to the tensile strength of iron and steel.

Mr. Sellers moved that the report be received and filed with the minutes, and printed. The report was indorsed generally, for the soundness of its views.

The report of the Committee on

BOILER INCrustation

was next read, H. A. Towne, Chairman.

The report refers to the imperative necessity of purifying the water by decomposition, or infiltration, before it is placed into the boiler. Process suggested by Mr. Hayes, of the Illinois Central, possessing very valuable features, and statistics from the New York Central, showing cost of fuel on the Western Division to be \$20,000 more than on the Eastern Division, by reason of impurities in the water.

A resolution was appended to the report, that the Secretary be authorized to correspond with superintendents and master machinists of railroads where water of impure quality is largely used, with a view to experimenting upon the plan recommended by Mr. Hayes, or some other plan of purifying the same, and report at next convention. It was shown that about seventy per cent. of repairs of boilers are attributable to the use of bad water.

Mr. Philbrick sustained the report in a few remarks, exhibiting a fragment of a boiler head showing the extent of incrustation from impure water.

Mr. Chapman also added his experience in this regard. He had found boilers filled with mud, which, unless removed, very soon becomes hard. Of two boilers he had last winter, one of them was "blown out" every two weeks, while the other only once in six months. Last winter he had the flues of the former taken out and found the boiler comparatively free from

mud. He was strongly in favor of the "blowing out" process often.

WATER IMPURITIES.

Mr. Dodge was glad to know that some elaborate experiment was on foot to precipitate the impurities of water used in boilers—and referred to the Eastern and Western divisions of the New York Central, the latter of which cost \$7,000 more per year for fuel than the former, on account of the difference in water used on either division.

Mr. Ham, of the New York Central, said that arrangements were being made to secure soft water also on the Western Division of his road. Every twelve months, where "hard water" was used, the boilers became so completely filled with mud that they had to cut the flues off each end. He had to take out from thirty to fifty flues every six months to clean out boilers.

Mr. Sellers, of Keokuk, Iowa, said his road, in using Mississippi River water found great difference. He had to take out from thirty to sixty flues, and work on the boiler every five months when that water was used, and find the boiler filled with mud. He thought the best plan for ridding the boiler of this muddy sediment was to put in blower cocks, and blow off each day one gauge of water—with this but little trouble was experienced. He thought this a desirable appliance to put to any engine, stationary or locomotive.

Mr. Hayes, on the subject of incrustation, said the State Geologist of Illinois had reported that these water impurities could not be precipitated but by high temperature. The New York Central Railroad report showed that it cost as much to precipitate foreign matter as to clean the boiler. If company would use the experiments recommended they would result in great benefit where they must use impure water. The talents of master mechanics combined had been taxed for ten years to get rid of the scale. The Baltimore & Ohio road used mountain water and could run twelve months and not get as much mud in the scale of the boiler as in the West, where the water is impure, in one week.

Mr. Towne, of Hannibal, continuing the subject under discussion, thought it dangerous to "blow off" under pressure in any way. In England the mud-drum would frequently keep the boiler comparatively free from mud, but an increase could be prevented by blowing off the boiler, under pressure, by allowing it to cool, though it is seldom done. If increase of mud accumulates, it forms a white, pasty substance that could be removed by the broom and force-pump. Water should be filtered before going in the heater. When the water has a white milky appearance, we may conclude that it is the result of lime or decomposition. He had found one-fourth of an inch sediment in the bucket during a single night. The only safety lay in purifying the water. He indorsed the report of the committee, and the plan of Mr. Hayes, and thought it ought to be thoroughly tried.

Mr. Hayes agreed to what Mr. Towne said of blowing out engines. But what is to be done on a road whose power is taxed to its utmost? An engine comes in at 10 p. m., and must start out at 6 in the morning. Hence there is no time for letting the water out. If the boiler could be allowed to stand one night, and washed out in the morning, most of the sediment might be forced out. But most roads had not enough engines, and so long as this deficiency exists we must continue to have mud.

BOILER EXPLOSIONS.

J. Losey, Louisville, New Albany & Chicago Railroad, Chairman of the Committee on Boiler Explosions, reported: The experience of the past year serves to confirm facts elicited in the former report. The majority of the explosions that occur are attributable to bad material, neglect in construction, ignorance, and incompetency in management of roads. An addition of trains in construction and operation would add greatly to the safety of the traveling public. Ordered to be filed.

On the subject of explosions, Mr. Setchell thought that in cases where a boiler cracks after being in service only a few months, it could be patched to advantage. If the iron is not good, the sheet should be thrown away. But if merely corroded at one edge of the seam, is it economical to patch or take out the whole sheet? He thought the former. In case of a fire-box, a new one might be put in. Roads changing from wood to coal show cracks immediately, and sometimes these engines could be patched and run a year.

Mr. Hayes remarked that there were cases where it was better to patch than to renew. In defect of manufacture of a sheet, it might crack in one week, and all the rest of the sheet be perfect, and with patching run ten years. Pieces of boiler plate that had been in use for fifteen years might be subjected to hydraulic pressure and pull in two, and still be good. Even after long use, unless there is deterioration in thickness, it may be as good as ever.

The Secretary read an article from the New York World of the 9th instant on the subject of steam explosions, which was ordered to be published with the minutes.

Mr. Boone: The reason a boiler explodes, nine times out of ten, is that the engine runs too long, and the boiler depreciates in strength. In England a boiler is discarded after running twenty years, while in this country they are kept on the track over thirty years. He had broken these old boilers and found them very brittle. A boiler leaks it is carried into the shop and patched; it leaks again, is again patched, and so on for months and years, until no particle of the original boiler is left. It then explodes, and we have fine-spun theories as to the cause.

After a boiler is used twelve years, throw it away. There was no economy in keeping it longer. Even those that looked safe had been found to break under the stroke of a 1½ pound hammer after long use. He had never broken a fifteen-year-old boiler whose iron was fit for anything. He had never seen a steam gauge that he would be willing to run two miles by. The steam gauges in use may be correct for a year or two, and may not for two days. A certain gauge he witnessed not long since indicated 110 pounds, when he

knew there was at least 150 pounds of steam on. Let us come down to hard facts, and get new boilers.

Mr. Boone was asked as to his experience in the tensile and transverse strength of iron, and answered questions in a satisfactory manner. Several gentlemen took issue with Mr. Boone on the subject of "patching," etc. Mr. Wells had, the past summer, cut up a boiler that had been in use twenty years, and could work it as well as new iron when subjected to heat. That part which had been exposed to the fire was, of course, brittle, but the balance was good. A patch here, he thought, could serve a good purpose. Iron may be broken by a blow that would bear a steady tension.

THE COMMITTEE ON CORRESPONDENCE

reported several communications to be read by the Secretary. Among these were invitations from Fletcher Perkins, Superintendent of Machinery of the Louisville & Nashville Railroad; Horace Scott, of the Jeffersonville, Madison & Indianapolis road; Mr. Sprague, President Ohio Falls Car Company; Colonel Samuel Gill, of the Short Line, asking the members to visit their works, ride over their roads, visit the fair, etc.

A committee was appointed to select a day for partaking of these hospitalities, and before adjournment had concluded to visit the Louisville & Nashville car shops at 4 o'clock in the afternoon of that day. They will visit the other localities mentioned some time during the week.

Several letters from absent members were read, and ordered to be placed on file.

The meeting adjourned at 9 o'clock p. m., to meet again this morning at 9 a. m.

Illinois Railroad and Warehouse Commissioners.

The Board of Railroad Commissioners were engaged yesterday in finishing their examination of the reports of the various railroad companies. Several of the roads not having presented their reports, and some of the reports submitted not furnishing the proper basis for determining the classification, it cannot be said with certainty at this time to what class they belong. Amended reports are required from these latter companies.

The following classification has been made of roads reported:

CLASS A.
The Chicago & Alton Railroad.

CLASS B.
The Illinois Central and the Chicago, Burlington & Quincy railroads.

CLASS C.
The Toledo, Peoria & Warsaw Railroad.

CLASS D.
The Western Union; the Illinois & St. Louis Railroad and Coal, and the St. Louis & Southeastern Railroad companies.

Class A is entitled, according to classification, to 2½ cents per mile; Class B, to 3 cents; Class C, to 4 cents, and Class D, to 5½ cents per mile.

The following companies have not been heard from: Indianapolis, Bloomington & Western; Peoria, Pekin & Jacksonville; St. Louis, Alton & Terre Haute; Chicago, Danville & Vincennes; Michigan Central; Pittsburgh, Fort Wayne & Chicago; Pittsburgh, Cincinnati & St. Louis, and Springfield & Illinois Southeastern railroads.

The Secretary of the Board was instructed to address the officers of the companies which had neither reported nor signified their readiness to report, requiring them to send in their reports forthwith, and that on failure, the Board would feel compelled to resort to legal proceedings to obtain the necessary information.

The Rockford, Rock Island & St. Louis; Illinois Central; Toledo, Wabash & Western; Lake Shore & Michigan Southern; St. Louis, Belleville & Southern Illinois, and the St. Louis, Vandalia & Indianapolis roads have given satisfactory reasons why their reports were not in by September 1st, and promise them immediately.

There are seven roads which are only in operation for a very few miles, being in process of construction, which are excused from reporting at the present, viz:

Chicago, Pekin & Southwestern; Chicago & Iowa; Gilman, Clinton & Springfield; Lafayette, Bloomington & Mississippi; Pekin, Lincoln & Decatur; Anderson, Noblesville, Lebanon & St. Louis, and the Indianapolis, Peru & Chicago railroads.

The following is the text of the letters sent out last night by Secretary Raymond:

STATE OF ILLINOIS,
OFFICE RAILROAD AND WAREHOUSE COMMISSIONERS,
SPRINGFIELD, Sept. 7, 1871.

To ———, President ——— Railroad Company:
SIR—No response having been received by this Board to its circular of the 13th of July last, I am instructed to require you to send to this office forthwith a full and true statement, under oath, of the affairs of your road as the same existed on the first day of July last, in accordance with the law of 1871, establishing the Board; together with certain specifications contained in the circular addressed to your company by this Board under date of July 13th.

And I am further instructed to inform you that in the case of failure on your part to make this report, or to signify immediately a readiness to do so at the earliest possible opportunity, this Board will feel compelled to resort to legal proceedings to obtain the desired information. Respectfully,
J. H. RAYMOND,
Secretary Board Railroad and Warehouse Commissioners.

The Board adjourned last evening to meet in Chicago at no distant day.—*Springfield State Journal*, Sept. 8.

—The European banks and bankers interested in the Northern Pacific Railway have sent out commissions to examine into the state of affairs of that company. The commissioners are Herr August Folsch, Vice-President of the Institute of Austrian Civil Engineers at Vienna; Chevalier R. de Grimburg, Professor at the Polytechnic Academy at Vienna; the Government Councillor Haas, Railway Director at Berlin; Mynheer N. J. Ten Dex, Secretary of the Chamber of Commerce at Amsterdam; and Herr Otto von Breitschwerdt, special correspondent of the *Frankfurter Zeitung*.



PUBLISHED EVERY SATURDAY.

CONTENTS.

Page.	Page.
ILLUSTRATIONS.	EDITORIALS.
Eyth's Patent Valve Gear.....271	Low Freights.....274
Indicator Diagram.....272	The Indianapolis, Cincinnati & Lafayette Railroad 274
Portable Railroad Truck and Cars.....[Plate and 277]	The Revere Accident.....274
SELECTIONS.	The General Ticket Agents' Association.....275
Bauschinger's Indicator Experiments on Locomotives.....271	The Master Mechanics' Association.....276
Steam Boiler Waters and Incrustation.....272	GENERAL RAILROAD NEWS.
Prevention of Railroad Accidents.....281	The Master Mechanics' Convention.....272
Illinois Railroad and Warehouse Commissioners.....278	Railroad Law.....276
Form of Contract for Railroad Grading.....275	Elections and Appointments.....279
Telegraph Department of Michigan Central Railroad.....277	Traffic and Earnings.....279
Railroad Construction over Tidal Flats.....278	Old and New Roads.....279
The Speed of Trains.....278	Mechanics and Engineering.....281
NEW PUBLICATIONS.....275	Miscellaneous.....279
	Rockford, Rock Island & St. Louis Railroad Co.....276
	Boston, Concord & Montreal Railroad Report.....276

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to Railroad men can have them fully described in the RAILROAD GAZETTE, if not previously published, FREE OF CHARGE. They are invited to send us drawings or models and specifications. When engravings are necessary, the inventor is expected to furnish his own engravings, or to pay for them.

Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this Journal in charge of these departments. He is also authorized to act as our agent.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

LOW FREIGHTS.

For a few weeks past the rates on freight from New York westward have been lower than at any time previous since 1861, the rate to Chicago being 35 cents per hundred on all four classes, while a "special rate" of 26 cents per hundred is made for the coarser freights. These rates, we understand, are the result of a disagreement of the several companies concerning certain questions, which it is proposed to settle in the usual way—by doing business at a loss until the falling receipts convince one party or all that there is at least one evil worse than the neglect of one's peculiar whim.

Now the public will not complain of any action of the railroad companies which injures only themselves. Especially will it not object to any permanent reduction of freight charges. A reduction of 10 per cent. only will save many millions of dollars to the country, and give an impetus to production and an increase of prosperity which could be counted only by tens of millions. But there is one thing more desirable than low rates, and that is regular rates. This we have pointed out frequently, but the evil of irregular rates is likely to be impressed upon Western merchants, and especially wholesale merchants, this fall as it never has been before. After these wholesale merchants had laid in the great bulk of their stocks, but before retailers had begun to purchase, rates were suddenly decreased from \$1.00 to 35 cents per hundred on first-class freights. It is evident that the cost of the goods previously received by the wholesalers is greater by the difference in freight than the cost of similar goods received now. It is too late for the wholesalers to take advantage of the reduction, but not for the retailers. Many who have been accustomed to purchase in Western markets go east to purchase in New York or elsewhere. This is an argument for regularity which the wholesalers at least can understand. They find that a reduction of rates is not an unmixed good.

There are many situations in which such sudden changes may work great evil. Suppose the case of a manufacture using a material whose transportation forms a large part of its cost. One manufactory, having laid in its stock in July and August at a dollar a hundred, has to compete with another which received its material in September and paid only 35 cents per hundred for freight. It is plain that the difference in

freight may more than equal the margin for profit, and that thus the reduction of rates may work the ruin of a well-conducted establishment.

Nothing is more unfavorable to confidence and to enterprise than uncertainty. Capital is very unlikely to embark in ventures which present no stable elements on which to base a calculation of its returns. Natural fluctuations may be foreseen and provided against; arbitrary changes cannot. They may falsify the most carefully made estimates in a day, and they affect most, of course, those branches of business which are managed most closely and with the least margin for profit.

It is not easy to exaggerate the advantage to the community of a considerable reduction of charges for transportation. If the present very low rates on west-bound freight could be extended to east-bound freight and maintained with but slight fluctuations from year to year, many kinds of business, and especially of manufacturing, which are now impossible would be come profitable, and others which languish would prosper. Agriculture, especially, would be made much more profitable, and doubtless millions of acres of wild lands in the West would soon be occupied and cultivated. But the temporary reduction which we now have is likely to be injurious to the prosperity of the country rather than beneficial. That it is not possible to maintain the current low rates is probably true; but there seems to be no good reason why a mean between these rates and the higher figures which rule quite constantly in the other direction and for most of the year on west-bound freight should not be maintained. We believe it would so encourage production as to materially increase traffic, and it would certainly make business operations more certain and prosperous. For about one-half of the year 1870 the rates on west-bound freight and a part of the time on some classes of east-bound were extremely low. Yet it was understood that such rates were exceptional and that they would soon be raised, so no business was established on that basis. If the reduction had been distributed over the year, it would have encouraged business, and, doubtless, increased traffic. The reports of the various companies showed that the year, as a whole, was a prosperous one; if they lost money in the summer, their profits were very large in the fall and winter. It would be better for the community, and, doubtless, better for the railroad companies, if the latter should make a moderate profit at all times and an immoderate one at no time.

This is something which can be settled only by some permanent agreement among the companies. There is a popular feeling against combinations among companies and in favor of unchecked competition; but the latter, it is evident, is the chief cause of the great fluctuations, while regularity can be secured only by the former.

The Indianapolis, Cincinnati & Lafayette Railroad.

This road has been operated by a Receiver for some time past, and several of the creditors have brought suits to bring it into bankruptcy. Lately, however, a combination of principal creditors with the directors drew up an agreement by which it is hoped that the company will be saved from bankruptcy, but placed in such a condition and operated under such management that the creditors be paid and the road preserved by the company if possible.

According to this agreement the claims against the company are as follows:

By the holders of bonds of various issues prior to the mortgage of 1869.....	\$6,400,000
By the holders of bonds of 1869.....	2,000,000
Interest overdue and unpaid, about.....	250,000
Floating debt, about.....	1,500,000
Contingent liability upon Cincinnati & Martinsville Railroad Company's stock and bonds.....	800,000
Contingent liability upon the Little Miami Railroad Company's and the Indianapolis, Cincinnati & Lafayette Railroad Company's street connection bonds.....	525,000
Ditto, upon the Whitewater Valley Railroad Company's bonds.....	1,000,000
To the holders of the Cincinnati & Indiana Railroad Company's stock, guaranteed by the Indianapolis, Cincinnati & Lafayette Railroad Company, about.....	45,000
By the stockholders of the Indianapolis, Cincinnati & Lafayette Railroad Company, about.....	5,700,000

It is proposed that the company be re-organized, and that its capital be divided among the creditors according to the relative value of their respective claims, except that \$6,400,000 of liens previous to 1869 be undisturbed. Thomas H. Perkins, William A. Booth, Preserved Smith, Joseph Kinsey and A. S. Winslow are to be constituted agents, attorneys and trustees of the subscribers to the agreement. They are to procure or consent to a sale of the road and purchase it at this sale, having command of the various claims against the company to make payment for the same. The course of the trustees after the purchase is agreed upon is as follows:

The reorganization of the company under the laws of Indiana and Ohio.

The indebtedness due to holders of bonds of 1869 to be liquidated by new 30-year 7 per cent. bonds of the date of the reorganization. And the first coupons of these bonds, together with the overdue interest on the old bonds, to be paid in new 10-year 7 per cent. bonds, secured by a sinking fund of at least \$15,000 per annum, and by a mortgage which shall be a prior lien to the proposed consolidation mortgage bonds.

These latter, which are to secure the bonds of 1869, will be secured by a mortgage upon the whole property, and are to be of an amount to cover these and all prior liens, amounting to \$6,400,000. The mortgage securing them is to provide for a sinking fund of 1 per cent. per annum on their amount.

The floating debt is to be liquidated by an issue of 7 per cent. income bonds, to be received at par by the creditors, the total issue of which shall not exceed \$1,500,000. The net earnings of the road above the amount necessary to meet the interest on the consolidation bonds are to be applied to the payment of the interest on these bonds, and of any overdue interest that may accrue on them; should there be any excess of earnings, it is to be applied to the cancellation of these income bonds so long as they can be purchased for less than 80 per cent. of their par value. Should the price be higher, the excess is to be applied to the formation of a sinking fund of not less than \$20,000 per year, for the payment of these bonds, and beyond that to the payment of dividends on the stock. The income bonds will be a second mortgage on the entire property, and Thomas H. Perkins and Henry A. V. Post are to be the trustees of these bonds.

Holders of Cincinnati & Indiana Railroad guaranteed stock are to receive income bonds to the amount of their stock at par.

Holders of Indianapolis, Cincinnati & Lafayette stock will receive a share of stock in the new company for two shares of stock in the old.

The trustees are authorized to use their discretion in paying all contingent claims. Fractional amounts are to be paid in scrip convertible into bonds. Income bonds to the amount of not more than \$150,000 may be used to settle secured debts and pay the expenses of reorganization.

This agreement is to take effect after two-thirds of the bondholders of 1869 and two-thirds of the unsecured creditors shall have signed it.

Each certificate of stock of the reorganized company shall have indorsed upon it, be it issued, an agreement on the part of the person to whom it issued to give the proxy of the owner for five years to Henry A. V. Post and A. S. Winslow to cast the vote due to the share for three of the nine directors, the owner preserving the right to vote for the other six.

We understand that most of the creditors have consented to this arrangement, and that most of their suits to force the company into bankruptcy have been withdrawn.

The Revere Accident.

The *Telegrapher*, reviewing some remarks on this accident published in the RAILROAD GAZETTE recently, says:

"Had the system of dispatching and running trains by telegraph, adopted on the Western roads, been in use, the massacre could not have occurred. The only telegraph lines and offices along the Eastern road are operated by the Western Union Company, the interests of the road being subordinated to those of that corporation. But little if any use is made of them by the railroad for the regulating and running of trains, neither can there be unless the road owns or controls its telegraph facilities. The franchise upon the New England roads has been practically given away to telegraph corporations instead of being retained by the railroad company, as is the case of the Pennsylvania Railroad and others. The consequence is that the roads are operated without telegraphic facilities, as they were universally ten or fifteen years ago. The only excuse offered for this is the expense which adequate telegraphic facilities entail, and the result is seen in such accidents as fill the columns of the newspapers with interesting but harrowing details of sacrifice of life and property, and the maiming and mangling of such as escape immediate death.

"The block system in use in England is an excellent one, and, with such modifications and improvements as are practicable, should be introduced in this country wherever roads are necessarily crowded with trains. It is the *revival* in operation on the road between New York and Philadelphia, but the execrable condition and management of the telegraph line on the road between the two cities makes its use far more theoretical than practical.

"A system of electrical railroad signals, such as may and will be devised, and the proper use of telegraph facilities by railroad managers and operators, would soon reduce the number of these so-called accidents to the minimum; and, if the directors of railroad companies are too short-sighted or penurious to voluntarily adopt them, they should, and eventually will, be compelled to do so by law. Until this is done we cannot join our contemporary in holding the managers of such roads as

refuse or neglect to avail themselves of the means of guarding against such accidents as blameless."

Certainly, managers of railroads cannot be excused for neglecting to adopt any means whose value in insuring safety has been fully demonstrated. When we wrote it did not appear that the Eastern Railroad was not operated by telegraph. The efficiency of the telegraph has been so completely demonstrated by years of successful use on a great number of railroads that it is not easy to understand that any company with a considerable traffic would refuse to avail itself of it, or that it could be justified in such neglect.

In the late accident on the Philadelphia & Erie road, an engineer and conductor were found dead with the Train Dispatcher's order in their pockets. It was a positive disobedience of this order, which seemed clear enough, that caused the accident by which they lost their lives. The *Philadelphia Railroad Register* says that it is evident that these men must have misunderstood the order, for it is not possible that they deliberately disobeyed, when disobedience was likely to (as it did) cause their destruction. But this shows that it is not enough simply to give orders; the officer must make sure that his order is understood; and this is a principle which cannot be urged too strongly or observed too carefully. On the Chicago, Burlington & Quincy Railroad, and many other lines, as was shown in an article by Mr. Pope, which we republished from the *Telegrapher* some weeks ago, when an engineer or conductor receives an order he telegraphs back to the Train Dispatcher his understanding of that order, and then gives notice of his reception of the order and of his intended action under it. It is certainly strange that the engineer of the Philadelphia & Erie road could have misunderstood his order; but it would have been almost miraculous if he had reported that he understood it and then disobeyed it.

But this principle of repeating orders received can be extended beyond the province of the Train Dispatcher. Unless some such rule is adopted the officer can hardly be sure that his order is understood until it is obeyed. Under strict discipline the sentinels of an army are frequently inspected and required to state what course they are to take in case of such or such an emergency. Still greater pains should be taken in operating a railroad. Not very long ago a fearful accident was caused in California by the ignorance of a switchman, who, it was found, really did not know what to do when an irregular train appeared. He had been engaged as a promising man who seemed to have capacity for his place, but it was evident that he did not understand what was required of him, and that, though sufficient instructions may have been given him, the trouble was not taken to prove whether he understood his instructions.

The General Ticket Agents' Association.

The regular semi-annual meeting of the General Ticket Agents' Association will be held at the Continental Hotel, Philadelphia, beginning with the 27th inst., at 11 o'clock, a. m.

The Master Mechanics' Association.

We give elsewhere a report of the proceedings of this association during the first day of its fourth annual session, held during the past week at Louisville. A complete report of the proceedings will be given in the next number of the *GAZETTE*.

NEW PUBLICATIONS.

The Telegrapher.—This journal entered upon its eighth volume with the last number of last month, considerably improved. It is now published weekly, and gives a larger amount of original matter on the science and art of telegraphy than any other American journal, and that, too, of an excellent quality.

—The station-masters and flagmen on the Fitchburg Railroad are now supplied with six-minute glasses. When a train passes the glass is turned, and, if a train approaches before the sand has run out, a red flag is displayed, and the train is stopped. As soon as the sand has run out, the glass is turned again, and, if a train comes before the sand is down, two flags, red and white, are shown, which indicate "proceed with caution"; afterward a white flag shows the track is clear.

—The Rhenish Railway Company has received a concession for the construction of a standing railway bridge over the Rhine, at Rheinhausen, in connection with their branch line from Osterrath to Essen. Among the conditions appended to the concession it is expressly stipulated that all the buttresses are to contain chambers for exploding mines in case of need, and that the company pay over to the State the sum of 300,000 thalers for the purchase of two iron clad river steamers, and the construction of a creek to keep them in when not wanted.

Form of Contract for Railroad Grading.

In these days of active railroad building, doubtless a form of contract and specifications will be suggestive to many. The form we give is copied from a contract for building a portion of the Burlington & Missouri River Railroad in Nebraska, for which we are indebted to Mr. F. W. D. Holbrook, the Assistant Chief Engineer of that company:

This indenture and agreement, made between ———, party of the first part, and the Burlington & Missouri River Railroad Company in Nebraska, party of the second part, witnesseth: That the party of the first part, in consideration of the covenants, promises and agreements of and in behalf of the party of the second part, will, and hereby do agree, covenant and promise to, and with, the said party of the second part, to grade that part of the railroad of said company, as now staked out and located, viz: ———. All work to be done must be done in strict accordance with the specifications hereto attached, which specifications are hereby made a part of their contract. But to avoid all disputes, or that they may be promptly settled, it is mutually agreed between the contracting parties hereto, that the classifications of work or materials as provided for in said specifications as well as the amount of work done by the party of the first part, and to be paid for by the party of the second part, shall be determined by the Chief Engineer of said railroad, and if questions relating to the proper understanding of this contract or cases not provided for in this contract shall arise, that he, the Chief Engineer, shall decide all such questions and cases, and that his decisions shall be final, and both parties shall and will be bound by them. The parties of the first part also agree to grade said railroad under the directions and supervision and to the satisfaction of said engineer, whose orders in all matters relating to this contract they agree implicitly to obey. The said Engineer will provide for the use of the contractors profiles with approximate estimate of quantities, which, however, are not to be taken as final quantities, and will stake out the work to be done from time to time. The contractor or party of the first part will be held responsible for the needless destruction, or misplacement, or pulling up of stakes, and he will be expected to pay the cost of replacing them, such sum to be deducted from regular monthly estimates. The party of the first part agrees to grade said railroad in strict conformity to the staking out and directions of the said Engineer, and to do all in a thorough and workmanlike manner. The party of the second part reserve the right to change or alter, if necessary or interest requires, either line or grade, or both, but no change shall be made in price per cubic yard on account of difference or quality of work upon such changes.

The line of road to be graded under this contract, and elevations, cuts and fills, grades, etc., are shown upon plans and profiles to be seen at the said Engineer's office in Plattsmouth. The profiles cannot of course show side ditches, culvert ditches, or changes of water courses.

The work is divided into sections of about one mile each, as shown upon said profiles, and only quantities contained in regular excavations and embankments are shown, and those are only approximately estimated. Of the excavations and embankments which may be found on any of these sections, only that which exceeds the other in quantity will be paid for. But it is hereby agreed between the parties hereto, that it shall be left to the choice of the Engineer whether to measure earth work in excavation or embankment. If the latter course is adopted, then the book quantities only, that is, the amounts contained within the grade, the slopes and the surface line shall be paid for. The Engineer may require that so much more earth than as above as may be required to maintain the banks at grade shall be put upon the slopes and top of bank. This amount is to be fixed by the said Engineer, but is not to be paid for, being only an allowance for shrinkage. No earth work shall be paid for twice. Of the grubbing and clearing only so much as the Engineer may decide to have done shall be grubbed and cleared by the parties of the first part. It is understood, however, because it is so little in quantity, that no distinct price shall be paid for grubbing and clearing, but that it is to be done according to the directions of said Engineer, and that the price for doing it is to be included in the price per yard of grading. The parties of the first part will be held responsible for all damages done to premises through which said railroad line runs, whether done or permitted by themselves, or their agents or sub-contractors, and whenever such damages occur, be it done by order or through neglect or carelessness, the parties of the first part agree to settle promptly all such claims, or, in case of their neglect, to pay the expenses of settling them. In the event that there is not sufficient material within the lines of the right of way for the construction of the embankments, of which the Engineer is to be judge, then the party of the second part agrees to procure the necessary land from which to borrow, upon the receipt of a written request from the party of the first part, giving reasonable time. It is, however, understood that the party of the second part shall not be obliged to pay an unreasonable price to secure borrow pits in the requested location.

The party of the second part hereby agrees to furnish the right of way, but no claim for damages arising from delay in obtaining title shall be made by the parties of the first part. Should it, however, appear that inability in procuring the right of way should actually and unavoidably have caused a delay in the completion of the contract, then so much time as was thus lost shall be added to the time for completing this work: notice of such delay shall, however, be given in writing to the Chief Engineer at the time such delay occurred, otherwise all claims shall be waived under this clause. It is understood hereby that the party of the second part will not procure either passes or half-fare rates for men or material for the use of contractors on any other road, but that they will pass both ways over their own road the principal and sub-contractors and their agent, and that they will pass west only all men in the actual service of the contractors in doing their work under their contract, and all material entering into the construction of this road, provided it be loaded or unloaded by or at the expense of the owner. The contractors will, however, be required to sign a certificate to this intent, which, on being countersigned by the Chief Engineer, shall be good for a free pass on trains. All material under this arrangement must be way-billed and loaded and unloaded with utmost despatch. Should there be any abuse of this privilege, then the party of the second part is to be justified in terminating it.

The party of the first part hereby agrees to sublet this work only to those who themselves are actually to do the work, that is, that there shall not be a sub-contractor beneath a sub-contractor; and he also agrees that such sub-contractors shall be persons acceptable to the said Chief Engineer, and should they in the judgment of the Engineer afterwards prove themselves to be unworthy, unfit or inefficient, the party of the first part hereby agrees to discharge them; making his contracts with them subject to this condition, and on his failure

to discharge them when requested by the Chief Engineer, that officer will have the right to discharge them.

The party of the second part agrees that as the work progresses, approximate estimates shall be made of work done, and upon presentation of such estimates, certified by the Chief Engineer, it will pay to the parties of the first part the amount of such estimates less ten per centum, which percentage will be retained in the manner stated below as security for the faithful performance of all the agreements, covenants and promises of said parties of the first part as exhibited in this contract.

It is also mutually agreed that in case it shall appear to the said Chief Engineer that the parties of the first part during the progress of this work shall neglect or refuse to prosecute the work embraced in this contract with sufficient energy to insure its completion in the time specified, or violate any of its provisions, then upon the statement of such facts in writing by the said Engineer to the party of the second part, full power and authority is hereby vested in the said party of the second part to declare this contract forfeited, and on such declaration being given in writing by or through the Chief Engineer, this contract shall cease and determine immediately, and the party of the second part may forever retain the reserved percentage, which shall be considered and treated as legitimate damages which it may have sustained by reason of the forfeiture of this contract.

It is also agreed that in case the said Chief Engineer shall be of the opinion that any portion or portions of this work are not progressing at such rate as will insure the completion of the work according to contract, then if he so elect he is hereby invested with full power and authority, any supposed rights or privileges of contractors or sub-contractors to the contrary notwithstanding, to place such force of men on said work as will in his judgment be desirable for the quick completion of such portions of the work, the expenses of which so incurred shall be deducted from the amounts agreed to be paid to the parties of the first part under this contract. And it is also agreed that if during the progress of this work labor shall be performed or anything occur for which the said parties of the first part consider themselves entitled to extra compensation, they hereby agree to present such claims as may occur in each month to the Chief Engineer of said road for adjudication before the tenth day of the succeeding month, in failure of doing which such claims shall be considered as waived.

An estimate or payment for any work will not, and shall not, be an acceptance of the work, or understood as approving the same. No contractor will be allowed to break ground until the contract is signed and delivered to the parties, and no labor nor pay for the same will be allowed on the Sabbath without the consent of the Engineer in writing.

In consideration of all which agreements and covenants the party of the second part promises and agrees to and with the parties of the first part, whenever this contract shall be wholly completed and their part in agreement with all said agreements and covenants and certified by the Chief Engineer, to pay for such work as follows:

For GRADING:
Earth work.....cents per cubic yard.
Solid rock.....cents per cubic yard.

SPECIFICATIONS.

GRADING.

The clearing and grubbing is to be done without charge, except as the price therefor is included in the price per yard for grading; but so much of the ground included in the right of way as is ordered by the Engineer is to be thoroughly cleared of all trees, logs, brush, rubbish, or other perishable material, all of which must be removed, burned, or otherwise disposed of, as the Engineer may decide. All stumps and large roots standing within the limits of the embankments or excavations shall be dug out and removed to the depth of not less than two feet below grade.

Excavation must be taken out in such shapes and widths and with such slopes as the Engineer may determine, and must agree on the bottom with the established grades and lines. Ditches shall be made throughout all cuts on each side of the center line, their dimensions and location to be determined by the said Engineer.

Grading shall include all excavations and embankments required for the formation of a road-bed for a single track and all necessary turnouts, also the digging of all ditches, the foundations for masonry, bridging or trestle-work, and banking of water from the same, changing the direction of the streams of water, cutting down or raising up any highway or private way, and all other excavations and embankments in any way connected with or incident to the construction of the railroad, excepting the preparation of depot grounds and sites for water stations, which shall also be included if required by the Engineer. All grading shall be done and estimated by the cubic yard, measured either in excavation or embankment as heretofore specified, and shall be comprised under the two following heads, namely: earth and solid rock. Earth shall include everything not distinctly so labeled. Solid rock shall include all stones measuring more than ten cubic yards and all ledges which cannot be taken out without blasting or splitting by means of drills, hammers and wedges. The use of drills and powder shall not be considered presumptive evidence of solid rock. The road shall be graded for a single track, except at sidings, as required by the Engineer, with a bed of such width and slopes of such inclination as the engineer shall designate, and in conformity to such depth of cuttings and fillings, and to such demarcation as may have been or may hereafter be determined and fixed upon as guides and boundaries for the work. All stone taken from excavations shall be removed to such place on the section as the Engineer may designate. On the left hand side of the road going from Plattsmouth there must be berms left in embankments of not less than eight feet in width, and on the right, berms of not less than twenty feet in width, and in excavations of twenty feet on each side, from which berms earth must not be borrowed, and upon which earth or rock must not be wasted. Neither will borrowing be permitted from the sides of the embankments, opposite to the sides of bridges or culverts, nor within one hundred feet of such sites, except by written permission from the said Engineer. It is not determined whether to build bridges or culverts for the passage of water through the embankments. The right is therefore reserved to the Engineer to direct openings to be left in the embankments, of such width and at such places as the said Engineer may direct, said openings to be filled by the party of the first part at the request of the Engineer, if made before the completion of the work under this contract. The right is also reserved to the Engineer to reduce the widths of excavations to be made to such extent as he may choose, and to make only a narrow cut sufficient for the passage of trains, payment being made only for the number of cubic yards actually removed by the party of the first part. When embankments run over culverts or abut against masonry or bridges the earth forming such embankments must be made as compact as possible, and special care must be taken to avoid all lateral or other undue or injurious pressure upon the masonry or bridges. All borrowing and wasting shall be done in a neat and proper manner, and under the direction and to the satisfaction of the Engineer, and shall be confined within such limits as he shall designate. No grading material, whether properly hauled from excavations into embank-

ments or wasted or borrowed, will be paid for twice. The regular excavations and the various ditches are to make embankments as far as they will go, or are needed, and will be measured accordingly and only once.

In witness whereof, the parties hereto have signed this agreement, this — day of —.

Boston, Concord & Montreal Railroad Report.

The Boston, Concord & Montreal Railroad extends from Concord, N. H., northward to Lake Winnepesaukee and thence northwestward to Wells River, Vt., 93½ miles. The company operates under a lease the White Mountains Railroad from Wells River northeastward to Whitefield, 31 miles.

The earnings of this road for the years ending March 31, 1870 and 1871, were as follows:

	1870.	1871.
From passengers.....	\$79,425	\$194,572
From freight.....	9,845	361, 84
From mail.....	10,168	10,198
From express.....	6,351	6,100
From miscellaneous.....	833	639

Total.....\$506,523 \$872,405

Expenditures, viz:

Maintenance of way.....	\$175,426	\$182,750
Maintenance of motive power.....	18,429	18,429
Cost of working road.....	108,308	115,505
Cost of management.....	11,984	12,086
Miscellaneous.....	23,683	27,335

Total.....\$425,831 \$446,495

Net balance.....80,691 126,000

Balance, March 31, 1870.....\$197,020

Interest received during the year.....8,611

In hand of superintendent less than last year.....1,582

Total.....\$333,215

Appropriated as follows:

Paid coupons, back coupons, interest on over-due bonds, etc.....	\$68,357
Paid preferred stock dividends.....	45,369
Wood, oil and stock on hand more than last year.....	7,069
Engineer department more than last year.....	14,598
Paid trustees of sinking fund.....	12,500
Paid sundry expenses.....	6,097
Bonds and cash on hand.....	175,432

Total, as above.....\$333,215

Compared with the previous year, the gross earnings show an increase of \$65,972 13, with an increase in expenses of \$20,603.99—making an increase in the net earnings of \$45,368.14.

The report says:

The two dividends for the year on the preferred stock have been declared and paid, and charged in the accounts.

The sinking fund, with its accumulations, and the annual payment of \$12,500, which has been made, now amounts to \$281,000.

The \$350,000 of convertible mortgage bonds that became due the 1st of July last, have been arranged in this way: \$233,700 of them have been extended for five years, by attaching coupons for that time, at same rate of interest.

The holders of the balance declined to do this, and the bonds have been, with the exception of \$3,200, taken up, and held to be arranged as the road may wish.

The suits in equity, White Mountains Railroad (old corporation) and others vs. Boston, Concord & Montreal Railroad and White Mountains (N. H.) Railroad, have been amicably settled and discharged.

The extension of the White Mountains (N. H.) Railroad was completed and opened to Lancaster in November last, for business, and we have been running passenger and freight trains there regularly since, with an increasing business and a prospect that it will continue to do so.

There has been expended by the corporation for this purpose to this time, about \$433,000, which is not included in the accounts, but will be when the road is completed. This amount is to be repaid to us by stock and bonds of the extension, secured by mortgage on the road, from Littleton to its terminus, wherever it may be when the road is completed.

Of the above amount, \$75,000 has been obtained by the three notes of the Boston, Concord & Montreal Railroad Company, of \$25,000 each, which are not included in our accounts.

TRIAL BALANCE, MARCH 31, 1871.

Construction.....	\$2,850,000
Wood, oil, etc., on hand.....	27,343
Stock, etc., on hand for repairs.....	46, 47
1870, bonds on hand.....	800
Trustees of sinking fund.....	176,500
Pemigewasset House.....	164, 00
Joseph A. Dodge, Supt.....	23,254
Cash on hand for coupons unpaid.....	879
Cash on hand for dividends unpaid.....	7, 39
Sinking fund and mortgage bonds, and cash on hand.....	186,914

\$3,336,079

Stock (old dividend, etc.).....\$459,900

Stock preferred.....80, 000

Stock new.....540,400

1,600,000

Bonds due in 1865.....76,000

Bonds due in 1870.....3,0, 00

Bonds due in 1880.....624,000

1,050,000

Coupons due and unpaid.....879

Dividends due and unpaid.....1,44

Dividends due and unpaid since May 20, 1869.....7,839

Profit and loss.....475,912

\$3,336,078

The Boston, Concord & Montreal Company has since taken possession of a further extension of the White Mountain Railroad from Whitefield northwestward eleven miles to Lancaster. This it will further extend to Northumberland, a station on the Grand Trunk Railway, and it proposes to construct a branch nine miles long to the foot of Mount Washington.

The Rockford, Rock Island & St. Louis Railroad Company.

It is no secret that for some time past the affairs of the above-named company have been in a very embarrassed state, so much so indeed that great apprehensions are entertained that they would not be able to pay the coupons of their mortgage loan due on the 1st of February last. This, however, they managed to do eventually, though at a later period. Since then, however, things appear to have become worse, and induced the whole Board of Directors, with the Treasurer and Secretary, to resign office, and quite a new set has been appointed by the shareholders. This is one of the numerous class of American railways constructed with a very small amount of capital and a very large number

of preference bonds; and as the latter were issued in 1863, just when the five-twenties began to rise so enormously in value, and as, moreover, the company had the good luck to be the first to offer them to the Germans, and at a very low rate, they were enabled to sell a surprising quantity to capitalists in Germany—chiefly at Berlin and Frankfurt. At that time it was generally considered a safe investment, being a first-mortgage loan of \$9,000,000, with 7 per cent. interest in gold, payable half-yearly by means of coupons attached to the bonds, and, being offered at about two-thirds of their nominal value, gave promise of a seductive return of 10 per cent. on the capital invested. We understand that at one time, not long ago, they were quoted in the Frankfurt share lists at 80 per cent. buyers, but when the late collapse occurred a panic seized the bondholders, many of whom sold out at 40; since then, however, they have somewhat recovered, and are now worth 44 to 45 per cent. in that market. It is stated, and we have reason to believe correctly so, that, with a few trifling exceptions, the whole of this large amount of mortgage bonds is held in Germany, not so much by the bankers and larger capitalists, but principally by dealers, comfortably-off tradesmen, landed proprietors and private gentry; but as the bonds are made payable to the bearer, they pass from hand to hand without control or the necessity of the transfer being registered, so that it is totally impossible to ascertain who are the real holders.

An organ to protect the interests of the bondholders being much wanted in Germany, it is greatly to the credit of our youthful cotemporary, the *German-American Economist*, of Frankfurt, that they have unhesitatingly taken up the cause with great spirit, and sent over to America one of their own editorial staff to make inquiries on the spot as to the state and prospects of the company, and have promised to publish a full report in their columns. At the same time they compelled the bondholders to hold a meeting on the subject, kindly offering the reading-room attached to their establishment for that purpose, and appoint a committee of their own to take the needful measures. This advice was too good to be neglected, and the meeting was accordingly held last week, and numerous attended by bondholders from all parts of Germany and Holland, whilst letters were received from a great many others unable to attend in person, but tendering by anticipation their adherence to any resolutions that might be passed by those present. Dr. Fester, Director of the Union Bank of Frankfurt, was called on to preside over the meeting. The Chairman briefly adverted to the objects they had in view, which were simply to insist on their legal rights being fulfilled, and to support each other by joint and united action, on the old principle that union gives strength. A lively debate then ensued, in which the word repudiation was used in not very flattering terms to our American cousins, and a determination expressed not to be bamboozled out of their property by the reckless conduct of the late directors, who, though they had resigned, were still responsible for their actions and amenable to the laws of the United States.

Mr. Murphy, late Consul-General of the United States at Frankfurt, confessed that he had always heard that the directors were spending the money very freely and paying much higher prices for the construction of the line than they should have done in common prudence and with reference to the interests of the bondholders. There could be no doubt that the undertaking was a safe one, and in good hands would become in time a profitable investment of capital, which would have been the case long ago if the money had not been so ruthlessly squandered away, the line costing 40 or 50 per cent. more than it ought to have done as compared with other railways in the same State. The immediate consequences was that the shareholders would lose all their capital and the line be transferred to the bondholders. As it passes through a rich, fertile and populous country there should still be a return of 5 to 6 per cent. It was true that \$1:00 were required to fence in the property, as the company had frequently had to pay heavy compensation for cattle that had strayed on to the rails and been killed by the passing trains. There was no doubt that purchasers might be found or the railroad leased for a term of years advantageously for both parties; and it had been asserted that definite offers had been made, but of this he had no personal knowledge. His opinion of Mr. Cable, the present Director, was that he was a respectable and honorable man, with an adequate knowledge of business. He considered it desirable to sell the eighteen-mile section that was at some distance off, and totally separated from the main line, and which would easily realize \$20,000 per mile. He had heard that Mr. Joy, one of the directors of the Michigan Central and also of the Chicago, Burlington & Quincy Railway Company, was inclined to buy the Rockford, Rock Island & St. Louis, but would not pay more than 30 or 40 per cent. of the value of the bonds, and were they to accept such an offer it would just be throwing away their property. He recommended the formation of a committee, with power to inquire into the affairs of the company and report what offers were made for the purchase or lease of the line. According to the laws of the United States a railway that did not pay debts promptly could be sold after the lapse of a certain period for the benefit of the mortgage bondholders.

Mr. Tausig said that though he was himself not a bondholder, he had attended the meeting, as he had resided at St. Louis for the last twenty-three years, and was willing to communicate what he knew about the company in question. It frequently happened in America that a new railway paid no interest for the first few years; but if not constructed in an unreasonably extravagant manner, it was generally found that they came round in the long run, as the population and traffic were everywhere increasing so rapidly in the Union. He firmly believed the bonds to be fully worth their nominal value, though now at a fearful discount; and recommended the bondholders to have patience and

act together, and he did not doubt that the result would be favorable.

The result of the meeting was the appointment of a committee, consisting of the following bondholders: Dr. Fester, Dr. Peisser, Mr. W. W. Murphy, Herr Jacob Ph. Emden, and Herr Strupp, banker at Meiningen, with power to add to their number and fill up vacancies. They are instructed to place themselves in communication with other committees that may be formed elsewhere for a similar object: examine accounts, documents, and witnesses, enter into negotiations for the sale or lease of the railway, but not to conclude any arrangement, agreement, or convention, without having reported their proceedings to the next general meeting of bondholders in Germany, and received their approbation and consent.

It appears from what fell from the lips of some of the speakers at the meeting, that the new Board of Directors have coolly proposed to the bondholders to suspend the payment of the coupons for the next two or three years, in order to be able to pay off the floating debt of some \$250,000, fence in the railway, the necessity of which was admitted by Mr. Murphy, and purchase a sufficiency of rolling-stock for about \$500,000, without which the traffic could not be carried on with any chance of profit. Some of the bondholders expressed themselves willing to consent to this proposal provided the unpaid coupons were funded and made to bear interest secured to them by a second-mortgage bond; but the general feeling of the meeting was to wait till the committee had investigated the affairs of the company and reported upon the same. In the meantime, the latest advices received from America show a marked improvement in the monthly receipts of the railway, probably in consequence of measures taken by the new directors; for whereas in May they were only \$52,958, and in June \$6,464, they had risen in July to \$75,706; and Mr. Cable writes to say that in the course of the autumn he hopes to see the monthly receipts above \$100,000. — *London Railway News*.

RAILROAD LAW.

Negligence.—What would be negligence for the purpose of saving property would not be for the purpose of saving human life.

In the case of *Anna Eckert, Administratrix, etc., vs. The Long Island Railroad Company*, recently decided in the New York Court of Appeals, a very nice distinction has recently been made in favor of human life, which, doubtless, should a similar case again occur, other courts would adopt.

The facts in the case are sufficiently set forth in the head note to the decision by the editor of the *Legal News*:

1. *Held*, That a person voluntarily placing himself, for the protection of property merely, in a position of danger, is negligent, so as to preclude his recovery for any injury so received, but that it is otherwise when such an expose is for the purpose of saving human life, and it is for the jury to say in such cases whether the conduct of the party injured is to be deemed rash and reckless.

2. The plaintiff's intestate seeing a small child on the track of the defendants' railroad, and a train swiftly approaching so that the child would be almost instantly crushed unless an immediate effort was made to save it, and in the sudden exigency of the occasion, wishing to save the child, and succeeding, lost his own life by being run over by the train, it was held that his voluntary exposing himself to the danger for the purpose of saving the child's life was not, as a matter of law, negligence on his part precluding a recovery.

Liability of Common Carriers.—What constitutes a contract limiting liability.—The case of *Dodd's Express*.

The case of *James B. Blossom vs. Moses Dodd, President of Dodd's Express*, recently decided by the New York Court of Appeals, is one of great interest to all common carriers. The facts are these:

On the 17th of October, 1866, the plaintiff was a passenger on a train of cars which was proceeding to New York on the New Jersey Central Railroad. When the train was nearly at the end of its route, and between the hours of ten and eleven o'clock in the evening, a messenger of Dodd's Express entered the car and inquired of him if he had any baggage to be delivered.

The plaintiff thereupon handed to the messenger two railroad baggage checks, one of which was for a gun-case containing a gun, and the other was a valise containing wearing apparel and other articles. The messenger entered the numbers of the checks in pencil upon a card or receipt.

At the time, the cars were running rapidly, the lights were mostly out, and the car in which the plaintiff was was nearly dark, but there was one light at the end.

The light was insufficient to enable the plaintiff to read the printed matter at the place where he sat, and he did not read it.

The said Dodd's Express received the valise and the gun-case from the railroad company, and on the following day delivered the gun-case, but neglected to deliver the valise or any of its contents to the plaintiff. Evidence tended to show it was stolen or fell from one of defendant's wagons.

The valise and its contents were worth about \$260. The referee found that the valise was stolen from defendant's wagon.

The answer put in issue the negligence and the value of the property lost, and set up a special contract restricting the liability of the defendant.

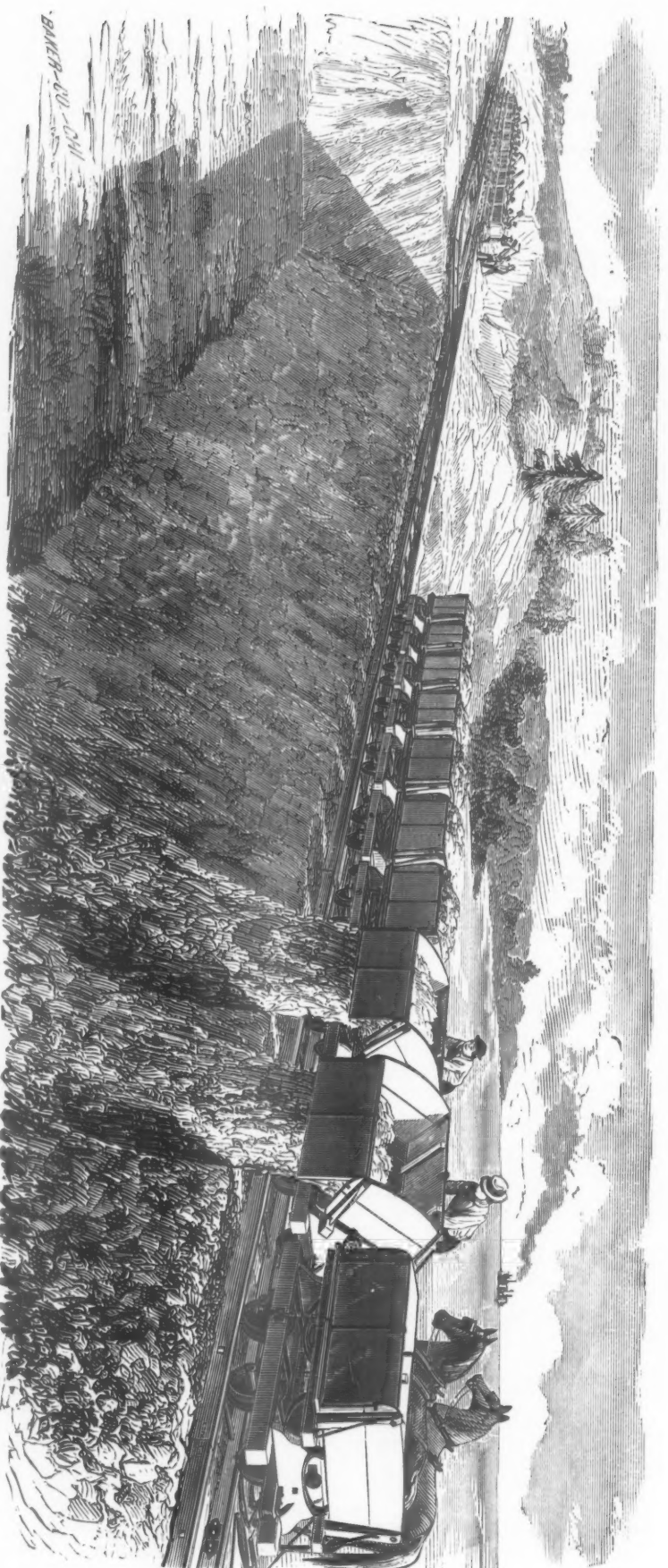
The court decides that no contract was proved.

1. Because it was obscurely printed.

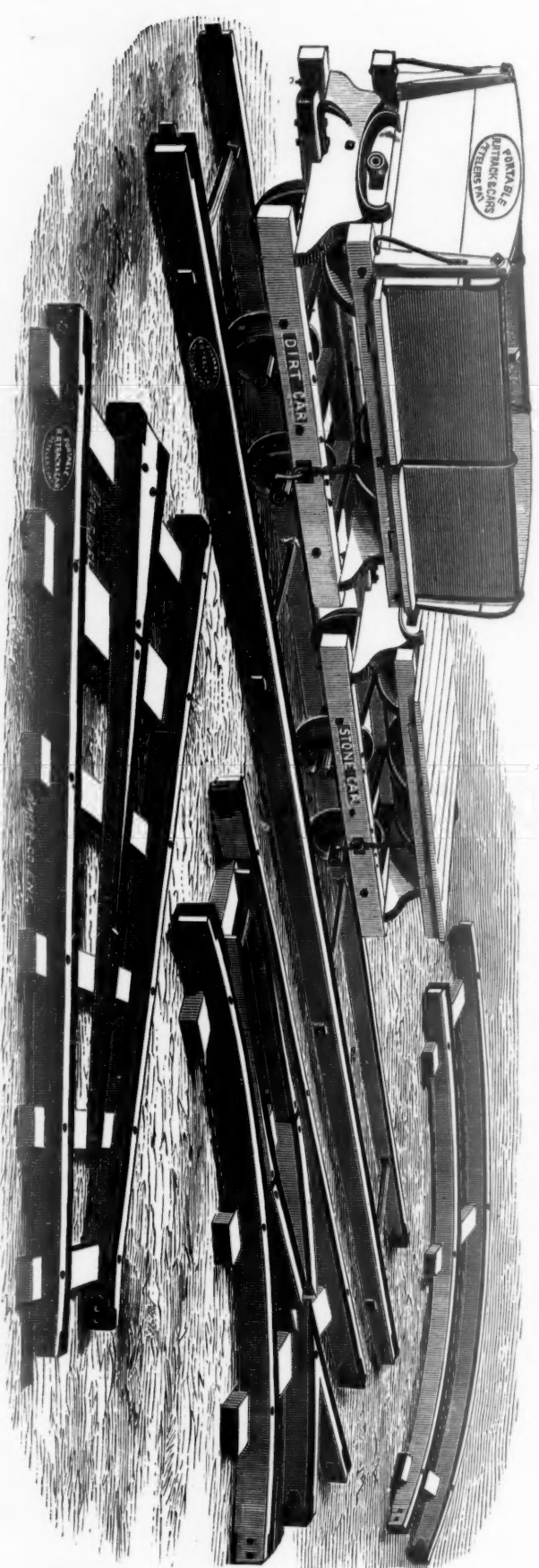
2. Because the nature of the transaction was not such as necessarily charged the plaintiff with knowledge that the paper contained the contract.

3. Because the circumstances attending the delivery of the card repel the idea that the plaintiff had such knowledge, or assented in fact to the terms of the alleged contract.





PORTABLE RAILROAD TRACK AND CARS; Cut and Fill.



DIRT CAR. STONE CAR. SWITCH SECTIONS. CURVED SECTION.

PORTABLE RAILROAD TRACK AND CARS.

We gave a few months ago a short account of the portable railroad track and cars invented by Mr. A. Peteler and used for moving material in railroad construction, etc. This week we present engravings which show very clearly the construction of track and cars and also the manner in which they are used in railroad grading. The companies which have controlled the patent in New England and in the other Eastern States, having their headquarters in Boston and New York, respectively, have been manufacturing and selling to contractors and others in those sections for two or three years past; but the owner of the patent for the West has, until very lately, used it only on his own contracts. For some months past it has been used near Chicago, for a time on the new Odgen Canal near Bridgeport, and lately and at present on the improvements in South Chicago near the mouth of the Calumet. It has attracted the attention and favor of a large number of contractors, and it undoubtedly deserves the examination of all who wish to move material in grading, etc., at the least possible expense.

bankment, or out of a deep cut, two or three may make a sufficient load. Usually two men work at the loading of one car.

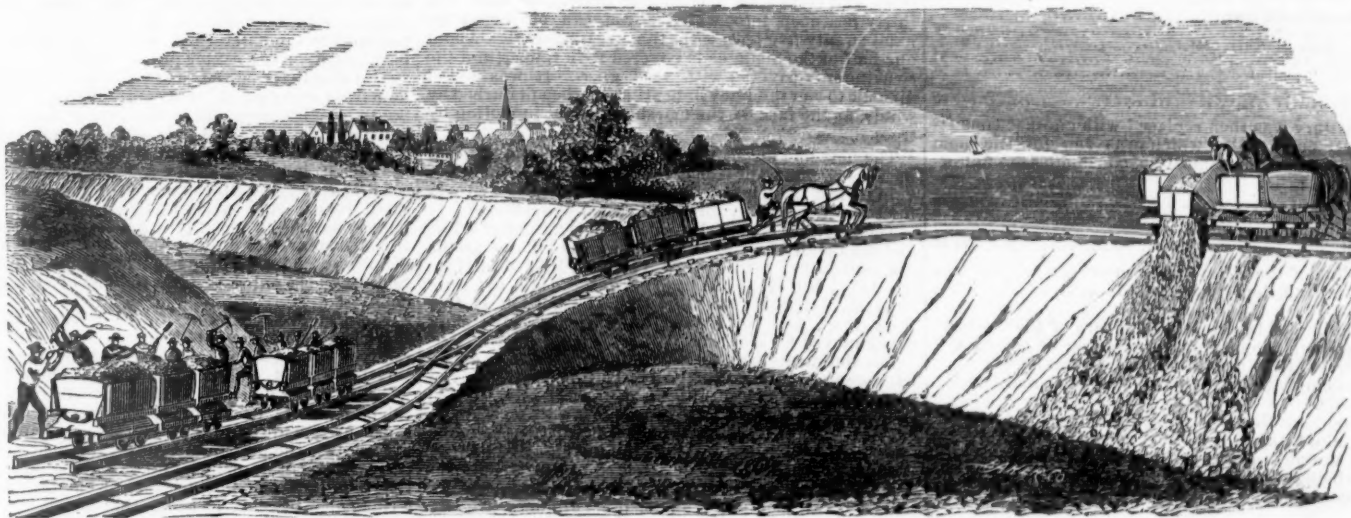
The economy effected by the cars is chiefly in unloading; but the great saving is in hauling, which is effected by the use of the track, which gives, on any ground and in any weather, a smooth and solid road, and can be rapidly and easily shifted as the work progresses, without delay to the shoveling gang, which would be impossible with a permanent track.

If the grade on the natural surface of the ground from cut to fill is not too steep the track can be laid on the surface, and, when the material has been removed to such a depth as to make the loading of the cars inconvenient, the track can be disconnected, dropped into the pit on either side and connected, and this process can be repeated until the required depth is reached.

By an inverse process, embankments may be made of any height. The track is first laid on the surface and the cars dumped on both sides. The track is raised by the use of a lever placed over one

method is shown by actual calculation to be one-fourth of that of hauling in wagons. The ground is raised but about 18 inches, and the practicability of the track is shown by the ease and rapidity with which it is shifted."

Although the portable track and cars were introduced into this country about three years ago, they have been comparatively little used in the West, the owner of the patent for that section having confined them to his own contracts. But there is one company in Boston and one in New York which are engaged in manufacturing and selling them, and they have been used in New York on the Morristown & Black River, and the Spuyten Duyvil & Port Morris railroads, in Massachusetts, on the Boston, Barre & Gardner, and the Cape Cod Extension; in Vermont, on the Montpelier & Wells River; in New Hampshire, on the Suncook Valley; in Indiana, on the Indianapolis & St. Louis, and the Indiana North & South; and in Illinois, on the Decatur & State Line, where they are now in use. After a formal examination by the United States Engineer Corps, it was recommended for use on government works, and has been used accordingly at numerous forts and light-house



PORTABLE RAILROAD TRACK AND CARS, HAULING UP EMBANKMENT.

The following description, in connection with the engravings, will enable our readers to understand the apparatus, and the advantages claimed for it:

The track is made in sections, usually 25 feet long, formed of two parallel timbers, usually 5 inches by 3 held firmly by iron cross-tie rods at such a distance that half oval iron rails about 1½ inches wide riveted to the upper surface form a track of 20 inches gauge, which has been found most suitable and convenient for railroad grading. At the end of the timbers are simple cast-iron locks, by which the sections are connected so as to form a strong and durable track of any length required. These sections are readily handled and put together by four men. By means of curved sections, a few of which are usually taken with every lot, a change in the direction of the track can be made at any desired point. Turn-outs and switches are also made in separate sections.

The cars are made of oak, combining strength with lightness. For railroad work they are usually made to hold a yard or one and one-quarter yards, but they can be made of any required size, as, indeed, the gauge may be changed to suit any peculiar work. These cars are four feet high, and consequently easy to load. They are so made that they may be dumped to either side, and thus unloaded instantly and almost without any exertion. The sides of the box that holds the earth are hinged at the top, so that when it is unlatched at the bottom, and the car turned on its side, it falls vertically, so as to be parallel with the bottom of the car, and leave the car without support. The engraving shows the operation of unloading very clearly. The moving of a handle at the end of the car opens this door and dumps the car, which is evenly balanced, at once, and the workman replaces the car in position for loading without moving from his place. Cars dumping at the end are also made for carrying stone, coal, etc.

Both track and cars are easily loaded and hauled where needed on an ordinary wagon. Ten cars and one thousand feet of track form a load for a platform car.

In operation two trains of cars are formed, varying in number according to the team and the grades. One of these trains stands on the track to receive its load, while the other is hauled out, dumped, and hauled back, a single team thus serving for both trains. Where the track is level a pair of horses will haul a train of ten or twelve cars; on steep grades up the sides of an em-

bankment, or out of a deep cut, two or three may make a sufficient load. Usually two men work at the loading of one car.

Parties who have used the portable track and cars make the following estimates of its advantages over ordinary wagons. The usual load of a pair of horses on a wagon is ¼ of a yard. On the portable track the same team will haul ten or twelve yards. Thus to do the work done on a portable track with twenty cars, one pair of horses and one driver, there would be required twenty-six wagons, thirteen pairs of horses and thirteen drivers.

Nowhere is the advantage of the track more evident than in moving material after heavy rains, when frost is coming out, or on marshy ground, where it is often difficult to draw an unloaded wagon.

In tunnel excavations short sections are used, by which the track can be extended as the work progresses.

Aside from railroad work, the portable track and cars have been used with profit in stone quarries and yards, where its portability makes it possible to bring track and cars just to the points where they can be loaded; in line kilns, for carrying material to the kiln; in coal mines, where every new working can be reached as soon as it is opened; and in coal yards and rolling and other iron mills, for unloading and moving coal and ore from cars and vessels, etc.

The following examples of operation are given as illustrations of the applicability of the track and cars to particular kinds of work:

"On the Indianapolis & St. Louis road about 100 cars and 4,000 feet of track were used. The haul was from 400 to 2,500 feet. Where a level haul could be obtained one pair of horses moved the earth for 24 shovellers a distance of 800 feet, with twelve cars in a train. In putting on the top of an embankment 25 feet high, of borrowed material, the track was laid up the side of the embankment, and two or three yards hauled in cars by a pair of horses as easily as three-quarters of a yard in a wagon.

"On the Louisville & Portland Canal 50 cars and 3,000 feet of track were in use. The banks were 40 feet high. The track was laid on an incline of about 10 feet rise in every 100. The load for a pair of horses was two cars of one yard each of earth or stone, against a half yard in carts or wagons.

"At South Chicago three-fourths of a mile of track is laid, and sand hauled from the lake shore to the low ground. The cost of moving the material by this

method is shown by actual calculation to be one-fourth of that of hauling in wagons. The ground is raised but about 18 inches, and the practicability of the track is shown by the ease and rapidity with which it is shifted."

It is also used in Prospect Park, Brooklyn, and in the Buffalo Park.

Mr. J. B. Brown, No. 314 West Monroe Street, Chicago, owns the patent for the West, and is now prepared to receive orders for track and cars.

The Telegraph Department of the Michigan Central Railroad.

BY F. L. POPE.

The Michigan Central Railroad was one of the earliest, if not the very first, among the Western railroads to adopt the system of moving trains by telegraph, which had been originally introduced with so much success upon the Erie Railway by Mr. L. G. Tillotson, about the year 1851.

In 1856 the late D. W. Smith, who had occupied a position on the Erie Railway Telegraph, built the line over the Michigan Central Railroad from Detroit to Chicago, of which he was Superintendent during some five years afterward. Mr. M. D. Woodford, who had been a division operator on the Erie line under Mr. Tillotson, was appointed Chief Operator and Train Dispatcher upon the new line. He proceeded to organize the telegraphic arrangements for the movement of trains upon a plan based upon and generally resembling that of the Erie Railway, with such modifications as circumstances rendered convenient and desirable. In 1861, or thereabout, Mr. Smith gave up his position on the Michigan Central to take a similar one upon the Hannibal & St. Joseph Railroad, which was then being constructed across the State of Missouri, and since that time the telegraphic department of the Michigan Central has been entirely under the direction of Mr. Woodford.

The present extent of the system is as follows:

Detroit to Chicago (two wires).....	579
Kalamazoo to Jackson via Niles (Air Line Division).....	151
Jackson to Grand Rapids.....	95
Joliet Branch.....	45
Total miles of wire now in use.....	869
Additional lines now in progress:	
On Chicago & Michigan Lake Shore Railroad.....	140
New wire, Kalamazoo to Jackson.....	70
Total.....	1,079

Other additions and extensions are contemplated, but have not as yet been commenced.

The Dispatcher's office, from which the movement of all the trains on the main line are controlled, is at Kalamazoo, Mich., which is almost exactly half way from Detroit to Chicago. The wire of the Air Line Division, which is a cut-off from Niles to Jackson, is also extended from the former place to the Dispatcher's office at Kalamazoo, and almost the whole business is therefore concentrated there. Six dispatchers are employed at this office.

Mr. Woodford himself—though more of a railroad

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—At the annual meeting of the Pullman Palace Car Company, held in Chicago on the 7th inst., the old Board of Directors was re-elected.

—Gen. William H. Seward, Jr., of Auburn, N. Y., has resigned his position as Treasurer of the Southern Central Railroad Company, to which he had been just re-elected.

—The annual meeting of stockholders of the Baltimore & Potomac Railroad Company was held in Baltimore on the 6th inst. Colonel W. D. Bowie, of Prince George County; Colonel Samuel Cox, of Charles County; George B. Roberts, of Philadelphia; Eli J. Hinkle, of Anne Arundel County; James C. Clarke, of Hagerstown, Md.; C. G. Miller, of New York; William T. Walters, of Baltimore, were chosen directors; Governor Oden Bowie was re-elected President, and J. N. Dubarry, Vice-President. J. S. Leib was elected Treasurer, and Stephen Little, Secretary and Auditor. C. G. Miller having tendered his resignation as a director, J. N. Dubarry was elected to fill the vacancy.

—The following directors and officers of the Kansas Central Railway Company—projected to build a 3-foot-gauge road from Leavenworth to Denver—were elected this week: Thomas A. Scott and Matthew Baird, of Philadelphia; Andrew Carnegie, of New York; L. T. Smith, J. C. Stone, Lucien Scott, P. E. Havens, Levi Wilson, H. W. Gillett, H. L. Newman and C. S. Stat-tauer, of Leavenworth. The Board of Directors selected the following officers: President, L. T. Smith; Vice-President, Lucien Scott; Secretary and Treasurer, P. E. Havens.

—Mr. A. N. Towne, General Superintendent of the Central Pacific Railroad—who was, on the 24th of August, appointed General Superintendent of the San Francisco & North Pacific Railroad, and who is also General Superintendent of the California Pacific Railroad and Steamers—announces, in a circular dated August 30, the following appointments: John Corning, Assistant General Superintendent, Sacramento; Geo. F. Hartwell, Assistant Superintendent California Pacific Railroad, Vallejo; A. A. Rem, Assistant Superintendent San Francisco & North Pacific Railroad, Donahue; Wm. H. Moor, Superintendent of Steamers, San Francisco; C. W. Smith, General Freight Agent, Sacramento; T. H. Goodman, General Passenger and Ticket Agent, Sacramento; J. R. Wat-on, Purchasing Agent, Sacramento; A. J. Stevens, General Master Mechanic, Sacramento; Benj. Welch, Master Car Builder, Sacramento; I. H. Graves, Assistant Master Mechanic California Pacific Railroad, Vallejo; S. B. Talbot, Fuel Agent, Sacramento.

—Mr. J. H. Crie, late Ticket Agent of the Boston, Hartford & Erie Railroad at the office in Boston, has been appointed General Freight Agent of the Texas Central Railroad.

—General C. H. Booth, of Dubuque, has been appointed General Freight and Ticket Agent of the Chicago, Dubuque & Minnesota Railroad, and Mr. Charles V. McKinlay, Assistant.

—The annual meeting of the stockholders of the Gold and Stock Telegraph Company was held at the office of the company, No. 61 Broadway, New York, on Tuesday, September 5th, at which the following directors were elected to serve during the ensuing year: Horace F. Clark, James H. Banker, Tracy R. Edson, Wm. Orton, Marshall Lefferts, Joseph M. Cook, A. B. Cornell. At a meeting of the Board of Directors, subsequently held, Gen. M. Lefferts was elected President, and Mr. J. M. Cook, Vice-President. The following directors were also elected to serve as the Executive Committee: Messrs. Horace F. Clark, James H. Banker and Tracy R. Edson.

—A circular from T. E. Sickels, General Superintendent of the Union Pacific Railroad, dated September 9, announces that E. P. Vining has been appointed General Freight Agent of that railroad in place of Colonel H. Brownson, resigned.

TRAFFIC AND EARNINGS.

—The miners and capitalists in Utah have recently held a meeting and appointed General E. L. Barnum a delegate to confer with the directors of the Union Pacific Railroad at their annual meeting, to induce them to lower their tariff on freights for crude ore and bullion. The present rates, they claim, are destructive to the interests of Utah and suicidal to the railroad.

—The Canadian Monetary Times gives the following statement of the receipts of the railroads of the Dominion of Canada for the month of July:

NAME OF ROAD.	Passen-gers.	Mails and Sundries.	Freight.	Total, 1871.	Total, 1870.	Miles.
Gt. Western	\$132,714	\$8,468	\$206,407	\$347,589	\$272,114	351 1/2
Gr'd. Trunk	235,260	23,000	363,516	621,806	560,853	1,377
Lon. & Pns.	2,797	125	2,993	5,919	4,395	24 1/2
Welland	1,661	913	6,099	8,672	5,395	25
Northern	13,954	384	14,071	28,409	28,759	97
Mid. of Can.	7,993	274	31,693	39,960	32,735	56
C. P. & M.	167	...	4,995	4,822	...	...
Brock & Ot.	7,500	...	18,321	25,821	...	...
Canada Cen.	3,446	...	559	3,995	...	...
St. L. & O.	7,290	940	2,430	10,660	9,987	54
St. L. & In	574	...	577	1,151	1,321	...
N. B. & Can	6,545	...	18,972	24,487	17,782	116
Ed. & N. A.	14,944	...	13,440	28,384	22,921	108
Western Ex.	...	...	...	...	...	...
Nova Scotia	14,373	837	16,660	32,370	31,235	145
Wind. & An.	...	...	...	...	...	...
Total	\$446,869	\$16,361	\$741,150	\$1,204,380	\$1,026,837	2,354

—The traffic receipts of the Great Western of Canada for the week ending August 18 amounted to £18,

897, against £13,945 in the corresponding week of last year, showing an increase of £4,925, or 35 per cent.

—The traffic receipts of the Grand Trunk of Canada for the week ending August 19 amounted to £34,200, against £28,100 in the corresponding week of last year, showing an increase of £6,100, or 22 per cent.

PERSONAL.

—An Akron, Ohio, letter to the Cleveland Herald says: "The probabilities are that Gen. McClellan will not accept the Presidency of the newly organized Atlantic & Great Western Railway Company. It is well known that he is Superintendent of the docks in New York city, and he thinks that in superintending them there is work enough for a life-time of service. If his plans are carried out, the docks of New York will in time surpass those of any European city, and he has a pride in superintending and overseeing them. So, no matter how much the purchasers of the Atlantic & Great Western Railway may desire the services of the General, he will prefer to remain in New York."

—Hon. John A. Poor, the most active railroad projector in Maine, the most prominent advocate of the Atlantic & St. Lawrence Railroad, which now forms the eastern outlet of the Grand Trunk of Canada, one of the originators of the European & North American Railroad, and since its organization President of the Portland, Rutland, Oswego & Chicago Railroad Company, died on the 5th inst., of heart disease, at his residence in Portland, Me.

MISCELLANEOUS.

—Japan has been placed in telegraphic communication with the world through the recent successful laying of the submarine telegraph cable between Hong Kong and Nagasaki by the China Submarine Telegraph Company. The ends of the earth are now telegraphically connected, and the work of telegraphic extension is proceeding with undiminished energy and persistence. This is an event of no ordinary importance, and two or three years since the announcement would have been received with great interest and enthusiasm; but, so accustomed have we become to telegraphic marvels that the event has been scarcely noticed. The stations upon the new line at present established are Shanghai and Hong Kong, China; Saigon, Cochinchina, and Nagasaki. The cable between Singapore and Penang will soon be laid. The line from Java to Australia will be completed before November 30th, and will connect with the lines already constructed to Adelaide, Sydney, New South Wales, and Tasmania.—The telegrapher.

—All the property and franchises of the Bankers and Brokers' Telegraph Company were sold at auction at Baltimore, Md., on the 6th inst., as previously advertised. The property was bid off by a Mr. Wells, who is the principal holder of the bonds of the company. The purchaser assumed all the liabilities of the company, which consist of \$105,000 bonds, and about \$30,000 of floating indebtedness, and pays in addition \$10,000 cash.

—A correspondent of the London Railway News says: "In order to ascertain the real losses of railway rolling stock occasioned by the war, a general counting of the wagons and carriages at all the stations in Belgium and France was held on the 10th inst., distinguishing the number belonging to each railway. At the pressing invitation and request of the Belgian State Railways and the Eastern of France Railway Company, the executive direction of the Association of German Railways has requested by circular each separate company to join in this inquiry and make up a return of the rolling-stock at every station on their respective lines on the same day (August 10) at noon, sending in the particulars of the owners of the carriages and the number of each carriage or wagon, which will then be compiled by the central executive, and a copy sent to each company for general information. This is the first time that such a census was ever got up in Germany; but it is practical, and gives so much satisfaction in railway circles, that I should not be surprised to hear that it will have become an annual standing institution, for, owing to accidents or negligence of officials, hundreds of carriages and wagons are lost every year, and used, if need occurs, by distant railways, who never think of sending them home, and the owners cannot claim them, as they are in perfect ignorance of their whereabouts."

—The Cumberland Valley Railroad has in its employ at Bridgeport, opposite Harrisburg, a switch-tender named Fred. Arnell, who has been in the service of the company in that capacity ever since the opening of the road—thirty-four years. In rain and sunshine he has ever been in his post, and although 80 years of age, he daily turns the switch. Mr. Arnell was born in France, and fought under the leadership of Napoleon Bonaparte in the memorable wars between 1812 and 1815.

—The La Crosse Democrat reports "the water so low in the Mississippi River that steamboats have to keep whistling to keep cows out of the channel. Many captains are having cow-catchers put on the boats. This is about the thinnest river yet discovered. They will have to melt ice pretty soon."

—The Norfolk Journal says: "The Alexandria & Fredericksburg Railroad Company, in combination with the Alexandria & Washington Railroad Company, commenced a short time ago to occupy the road-bed of the Washington & Alexandria Turnpike for a railroad track. Suit was brought by an owner of property fronting on the turnpike for an injunction to prohibit the proceeding. On Monday Judge Cockerill, of the Alexandria County Court, rendered a decision granting the injunction. He says, in his opinion, that the land occupied by the turnpike was granted for that specific purpose; that, if occupied for a different purpose, it will revert to the heirs of the original grantor; that a railway is not a "highway," in the sense contemplated

by the original dedication of the turnpike, which was that it should be free to the use of anybody with his private vehicle, and not to the exclusive use of a corporation with their vehicles."

OLD AND NEW ROADS.

Chicago & Northwestern.

The track of the Madison Extension was laid into Baraboo on the 7th inst. and the road was formally opened to that place on the 12th inst. amid great rejoicings. Baraboo is probably the largest and most flourishing town in Wisconsin that has been hitherto entirely without railroad connections, and it has been striving for twenty years to secure an outlet.

Its situation is such as to make it very difficult to approach it, and the work on the new road is probably as heavy as on any line in the Northwest. Much of the scenery is very wild and romantic, presenting a very strong contrast to the prairie country of the Northwest, and a trip from Chicago to Baraboo is likely to become popular among those who travel for pleasure. The distance from Madison to Baraboo is 33 miles. Thirty-six miles more of the extension, from Baraboo through Reedsburg to Waukesha, are under contract.

In the 33 miles between Madison and Baraboo it is reported that the quantity of excavation was greater by 2,000,000 yards than in the 242 miles of the Wisconsin Division between Chicago and Fort Howard, and, as much of the work on the former was through rock, the difference in cost was probably even more striking.

Cincinnati & Great Northern.

The corporators announce that more than 10 per cent of the authorized stock has been subscribed, and that a meeting for the choice of directors will be held at the office of the Railroad Record, in Cincinnati, on the 30th inst.

Sullivan & Assumption.

There is talk of constructing a narrow-gauge railroad from Assumption, on the Illinois Central Railroad ten miles north of Pana and very near the east line of Christian County, east by north across Shelby County to Sullivan, a distance of 26 miles.

Richmond & Danville.

A dispatch from Richmond, Va., September 12, to the New York Herald, says: "After a long and strenuous contest, in which local prejudices and the strongest opposition had to be overcome, the North Carolina Railroad was leased at a late hour last night to the Richmond & Danville Railroad Company for \$260,000 per annum for thirty years. This road is 223 miles in length, extending from Goldsboro, in the east, to Charlotte, in the western part of the State, by a circuitous route. It is principally owned by the State, its estimated value being \$2,000,000. The portion of it for which the Richmond & Danville Company had use in order to make through connections with the South is that between Greensboro, the terminus of the Danville road, and Charlotte, ninety miles in length. To obtain this they had to lease the entire road from Goldsboro to Charlotte. Possession was fully given them at a few minutes past 12, midnight, and the North Carolina road will now be operated under the control of A. S. Buford, President of the Richmond & Danville Railroad. By this operation Colonel Buford has consummated his long sought design of a continuous line from the Chesapeake Bay to Atlanta, Ga., and the Central South by the York River Railroad from West Point, Richmond. The Richmond & Danville road, from Richmond to Greensboro, the North Carolina road, from Greensboro to Charlotte, and a new road, now nearly completed, from Charlotte to Atlanta. It is needless to say that all these roads are controlled by the Pennsylvania Central Railroad Company, which has thus secured a monopoly of the travel and freights on two of the great Southern routes, the one stretching from Washington down the Atlantic coast to Wilmington, N. C., and the other from the Chesapeake Bay to Atlanta and the Central South."

Kentucky & Great Eastern.

The Board of Magistrates of Mason County, Ky., have decided to submit to the voter of that county a proposition to subscribe \$400,000 to the Kentucky & Great Eastern Railroad.

St. Louis & St. Joseph.

The St. Louis Democrat of the 14th says: "The St. Louis & St. Joseph Railroad, seventy-two miles in length, running from a point in Clay County, opposite Lexington, to St. Joseph, having been put into bankruptcy, the United States District Court, sitting at St. Joseph on the 13th of June, issued an order for its sale at auction in this city on the 13th of September. The road was accordingly sold yesterday."

"The first offer was \$5,000. This was increased by \$1,000 and \$500 advances until \$138,000 was reached, and there being no other offers, the road was knocked down at these figures to Colonel D. H. Armstrong, of this city. The purchase is said to be in the interest of the present owners of the North Missouri road. Major Brown, President of the Missouri Pacific road, was present, but did not buy the road, on account of the expense of making a connection with it at Lexington. The North Missouri crosses it four miles from Lexington. The company has liabilities of \$1,000,000 first mortgage, \$70,000 interest account, \$200,000 floating debt, and \$400,000 due the North Missouri road."

St. Louis & Southeastern.

The Mt. Vernon (Ill.) Free Press of September 7 says: "At latest accounts the track-laying on the St. Louis & Southeastern Railway were near Cottonwood, about eight miles this side of McLeansboro. We learn, also, that the track from Enfield to McLeansboro is within four miles of the latter place. George H. Varnell, tie contractor on the Shawneetown Branch, informs us that the grading between McLeansboro and the former

place is about all done, and that track-laying will commence immediately."

Canada Pacific.

The report of the surveyor employed to run the line of the proposed Canadian Pacific Railroad has recently been published. The distances, as stated by him, are as follows:

From Montreal to Ottawa.....	Miles.
From Ottawa to Mattawan.....	115
From Mattawan to Fort Garry.....	195
From Fort Garry to Yellow Head Pass.....	985
Thence to the limits of British Columbia.....	945
Route by the Upper Fraser (British Columbia) by "short cut".....	52
	447-2,477

Total length from Montreal to the Pacific..... 2,777

These distances are in large part estimated, as there has been as yet no survey of the whole route.

Memphis & Charleston.

This company, on the 2d of September, made a contract with the Nashville & Chattanooga Company intended to secure harmony in the future in the conveyance and transfer of passengers and freight. The Nashville & Chattanooga Company surrendered its purpose and agreement for purchasing the Winchester & Alabama Railroad.

Portland & Oxford Central.

The Portland *Evening Avenir* says: "We learn that the Portland & Oxford Central Railroad has commenced rebuilding the bridge at Pottle River, in Minot, with substantial granite abutments, and reducing the span to a truss of thirty feet, where heretofore the crossing has been over two hundred feet on piles, substituting solid earth embankment for the difference of distance. As the chasm at this point has been a very deep one, over thirty-two feet in height, the work is heavy, and the whole improvement is estimated to cost \$10,000."

"During the past year the bridges on this road at Sumner and across the two Allen streams have been rebuilt, and are in a most durable condition."

"We further learn that the company has decided to reduce the gauge of this road from five feet six inches to three feet, as early as new locomotives and cars of the narrow gauge can be substituted."

Cincinnati, Richmond & Fort Wayne.

Heavy preparations have been made for the construction of the line from Fort Wayne to Ridgeville, 53 miles. A large amount of grading is done and three miles of track has been laid from Fort Wayne southward. Track-laying is to be commenced at the Ridgeville end very soon.

Elizabethtown & Paducah.

This Kentucky railroad is in operation from Elizabethtown westward 93 miles to Greenville. A correspondent writes to us that track-laying is about to begin at the junction of the Evansville, Henderson & Nashville road, going eastward, about 20 miles to the Greenville terminus. The road bed from the junction westward, about 25 miles, to Princeton, will be ready for the track by the last of November; and from thence to Paducah, 47 miles, the grading will be completed next spring, or early in the coming summer.

Chicago & Freeport.

An effort is being made to obtain means for the construction of a railroad from Chicago a little north of west through Elgin to Freeport, or perhaps Rockford, or some point on the Illinois Central south of Freeport.

Coldwater & Muir.

A company was organized at Marshall, Mich., Sept. 7, to build a railroad from Coldwater to Muir—a distance of 80 miles. The following officers were elected: President, A. L. Green; Vice President, C. S. Crane; Secretary, George Ingersoll; Treasurer, C. P. Dibble. The board voted to take immediate steps for the extension of the line northward from Muir. It is the expectation to have the line from the Peninsula Railroad to Muir under contract within thirty days.

Peoria, Atlanta & Decatur.

The Peoria *Transcript* says the work of grading and bridging the line from Peoria to Atlanta is nearly complete, and will be finished the present month. Also that "arrangements have so far progressed as to insure the laying of the iron immediately thereafter. Contracts for the iron are not yet perfected, but matters are in such a condition as to render the success of the road beyond doubt."

Leavenworth, Lawrence & Gileston.

Another section of this road, 9 miles, from Cherryvale south to the Indian Territory line, was opened on the 6th of September. Coffeyville, the present terminus, is 133 miles from Lawrence, is situated on the south line of Kansas, in Montgomery County, on the west bank of the Verdigris River, and 55 miles west from the Missouri State line. Some of the principal stations on the road, and their distances from Lawrence are: Ottawa, 27 miles; Garnett, 52 miles; Iola, 78 miles; Humboldt, 86 miles, and Thayer, 98 miles. There is also in operation a branch 32 miles long from Ottawa to Olathe, on the Fort Scott road.

Dakota Southern.

A meeting of the directors of this company will be held at the Tremont House, Chicago, on the 26th inst., to confer with capitalists and railroad men, and try to make some arrangement by which the early completion of the road may be secured. A considerable amount has been secured by municipal subscriptions.

Quincy, Alton & St. Louis.

This road is now completed from Quincy southward 22 miles to a connection with the Hannibal & Naples Railroad at Kinderhook, and the first passenger train passed over it with an excursion party on the 14th inst. The report that it has been purchased by the Chicago & Alton Company is untrue, and it is now reported that it has been offered to the Chicago, Burlington & Quincy Company.

Wisconsin Railroad News.

There is much activity all along the line between Dubuque and Monroe in regard to the proposed railroad between these points, which would be of great value to Southwestern Wisconsin, Dubuque and Milwaukee. In addition to towns before reported, Wayne, Gratiot and Benton have voted aid to the road. It is thought that the towns along the line will give \$150,000, leaving \$100,000 yet to be raised to secure the building of the road. Of this, Dubuque will raise \$50,000, expecting Milwaukee to give the other \$50,000. The Milwaukee papers are urgently pressing on its people the importance of the road, which, with its Iowa connections, would be of great value to the trade and commerce of that city, and urges prompt action.

An extension of the Mineral Point Railroad from a point below the city of Mineral Point, through Mifflin, Wingville and Highland to the Wisconsin River, is getting encouraging votes of aid in Iowa County.

The contract for the grading of the first section of the Milwaukee & Chicago Railroad has been let, and work has already been commenced between Milwaukee and Bayview.

There was a largely-attended railroad meeting in Sauk City lately, and a committee appointed to confer as to terms with any railroad company that would build a road to that place.

The Milwaukee & Northern Railway is pushing its line forward toward Plymouth, and has 600 men employed on it grading and tying.

President Vilas has succeeded in making negotiations by which the Lake Shore Railroad is to be commenced immediately, and pushed on rapidly. The iron to complete the road from Milwaukee to Sheboygan has been bought, and is being shipped, and 4,500 tons are now on the way.

New Glarus, Green County, has voted \$20,000 to the Madison, Monroe & State Line Railroad.

The grading on the Wisconsin Central Railroad is completed from Doty's Island to Weyauwega.

The work of grading the extension of the Sheboygan & Fond du Lac Railroad has commenced, and from this on will be crowded through to completion. Most, if not all, of the contracts have been let, and laborers are wanted upon the entire line. The road-bed is to be completed to Ripon in sixty days, and to Princeton by the 1st of January. The iron is all ready.

The survey of the Milwaukee & Northwestern Railway to Fond du Lac is now completed. The track of the old Air Line survey is substantially the present survey, and will probably be adopted.

A contract has been made between the Oshkosh & Mississippi Railroad Company and the Milwaukee & St. Paul, by which the section from Oshkosh to Ripon is to be completed in sixty days, and operated by the latter company. The grading is being rapidly completed, and the rails will be delivered from the Milwaukee rolling mills, so that track-laying at Ripon can be commenced by the 15th, and pushed right along, and the cars be running by the 1st of November. Freight and passenger depots are located in Oshkosh. This road gives a direct line from Milwaukee to Oshkosh, and the Northwestern says: "It will not be long before we shall have connection direct with Madison, and by a northwest route, crossing the Wisconsin Central, with Wausau and Lake Superior. The twenty miles of road just secured is an important link in the chain of our eastern and southern connections."

From Portage north through Adams and Wood Counties, a lively interest is shown in the building of a road to Grand Rapids. Mr. Campbell reports everything favorable, and thinks the line will soon be ready for the shovel. Adams has voted aid liberally, and Wood is relied on to do likewise. The *Register* advocates the cordial co-operation of the citizens of Portage. There will be a strong effort made to commence work on the Chippewa Valley Railroad this fall, with a view to developing the large section of country between Chippewa Valley and Bayfield.

Concerning the Menominee Extension, from Fort Howard northward, the Green Bay *Advocate* says: "There are now about 1,500 men at work on the line, men are fast coming in, and all are given employment that apply. Camps have been established about one mile apart, and large forces of men are at work north from Oconto and south from Leshtigo. The road is already completed and construction trains running to Big Suamico, and, as the heavier work is now done, the contractors expect to lay half a mile of iron per day until the road is completed to Menominee, to which place chopping is now finished."—*Menominee (Wisc.) State Journal*, Sep. 9.

Milwaukee Lake Shore.

The Sheboygan (Wis.) *Herald* of September 8 says: "There is now absolutely no doubt but the Lake Shore Railroad will be built—and right away. Messrs. Vilas and Elwell have brought back positive and unquestionable proof that their mission to New York was a grand success. They have deposited \$70,000 in the German Bank; 4,200 tons of railroad iron (enough to iron the road between this city and Milwaukee) have actually been bought and paid for, and will be shipped immediately; 100,000 more ties for the road were bought and paid for in Chicago on Monday; the construction train and locomotive have been bought and will be shipped to this city without delay. Work will commence at this city on Monday, and will be pushed as fast as men and money can do it. We understand that it is the intention of the contractor to have the road in running order between this city and Milwaukee by the first of January."

Denver & Rio Grande.

On the 13th of September 37 miles of track had been laid on this narrow-gauge road. Excursions over the completed portion carrying celebrities are of almost daily occurrence. The iron is arriving and going down at the rate of from a mile to a mile and a half per day. It is expected that Colorado Springs will be reached by the 1st of October.

The Detroit Tunnel.

The drainage tunnel, which is to be below the main passage-ways, is to be first put through in order to determine more thoroughly the character of the soil to be encountered. This work has been let to Mr. George Chambers, of Chicago, who has just completed his contract in the La Salle Street Tunnel. The work was commenced last week under the supervision of Mr. Collins Chesbrough, brother of the Chief Engineer.

Mansfield, Coldwater & Lake Michigan.

The Mansfield (O.) *Herald* says that twenty-five miles of this railroad are completed on the Ohio Division, and if there is no delay in parties paying the stock subscribed as it is called for by the Treasurer, it is confidently expected that the road will be ready for the iron in November. The whole of the Michigan end of the road is nearly ready for the iron, a portion of the rails having been laid.

New York & Baltimore.

The Washington *Star* says: "The Pennsylvania Railroad interest seems to have driven another nail into the coffin of the Baltimore & Ohio Company. As the former combination virtually controls the lines between Philadelphia and Baltimore and New York, it now refuses to carry between these points the freight brought to Baltimore by the Baltimore & Ohio line from points in the West which are reached in common by the connections of the Pennsylvania and the Baltimore & Ohio roads. The result is that New York and Philadelphia freights, brought by the Central Ohio Branch of the Baltimore & Ohio road to the Ohio River, instead of being brought in bulk across the splendid new bridge at Bellair, and so over the main stem of the line, have to take the Cleveland & Pittsburgh road to that place, and reach their destination via Pittsburgh and Harrisburg. This arrangement destroys all the Western connections of the Baltimore & Ohio line with New York, except what it commands through the Parkersburg Branch and Marietta & Cincinnati, and where it does not compete with the connecting lines of its overpowering rival, and renders practically worthless very valuable feeders between Wheeling and Chicago, and also the costly bridge over the Ohio River at Bellair, until Mr. Garrett and his friends are able to build a new line between Baltimore and New York."

Laclede & Fort Scott.

It is reported that this company has closed a contract with John Fallen, G. S. Fitch, and Orville Grant (brother of the President) to construct a road from Fort Scott, Kansas, to Centralia or Odin, Ill., to be completed in two years. The road will cross the Mississippi River at Ste. Genevieve, and traverse some of the richest mineral sections in Missouri, and extensive coal beds in Illinois.

Madison & Portage.

For the extension of this railroad northward from Portage to Grand Rapids, Portage has voted \$200,000; Adams County, \$40,000; towns in Adams County, \$15,000, and other towns and counties were expected to vote \$120,000 more. The company is locating the line. By its contract with Wood County, the Madison & Portage Company is required to complete 30 miles of grading before the 1st of January next, and to fully complete the road to Grand Rapids before the 1st of September, 1872.

California Pacific.

The California Pacific Railroad Company, according to the *Solano Republican*, has given a second mortgage on that road to F. D. Atherton and Milton S. Latham, in trust, to secure the payment of bonds to the amount of \$1,600,000. The bonds are to run twenty years, and bear 6 per cent. interest. The purchase of the road by the Central Pacific, it is understood, extended only to a majority of the stock, which, beyond its importance as securing control of the road, could only be of nominal value as the first mortgage bonds had covered the value. The Central Pacific took possession of the road September 1.

Alabama & Chattanooga.

This railroad is now in operation from its southwestern terminus at Meridian, Miss., northwest to Attala, Ala., about 200 miles. From Attala to Chattanooga about 100 miles, it is still closed. A telegram from Chattanooga dated the 8th says:

"Chancellor Key to-day, on the application of the Attorney for the State of Alabama, gave a fiat, turning the Alabama & Chattanooga Railroad and rolling stock in Tennessee over to John H. Gindrat, Receiver of Alabama, as Receiver of the Court. In his decision, the Chancellor stated that if the property of the road in charge of the Receiver of another State was attached within his jurisdiction he would release the property, and he expected a like amity and comity from the courts of other States."

"Gindrat gave bonds, signed by Governor Lindsay, of Alabama, for \$300,000, and is now in possession of the road rolling stock, machine shops and depots of the Alabama & Chattanooga Railroad in Tennessee. The only obstacles now to the running of the road are attachments in Dad County, Ga."

"An application for a receiver similar to that just decided will be heard by Judge Parrott, at Trenton, Ga., September 19, and will undoubtedly be decided in a similar manner, so that trains may be expected to run on the road by September 20."

"The greatest delight prevails universally at the prospects of running the road. It will be perfectly safe for the State to run the road, as all parties are anxious to enjoy its benefit. Alabama, by the action of the courts, has possession of the entire line of road from Chattanooga to Meridian."

Gilman, Clinton & Springfield.

On Monday last the track-layers had reached the crossing of the Chicago & Alton Railroad, three miles from Springfield, and expected to reach Springfield on Wednesday the 13th.

Connecticut Air Line.

On the 9th inst. the city of Middletown voted against granting further aid to this railroad.

Delaware & Hudson Canal Company.

This company intends hereafter to construct no more 6-foot-gauge cars, but use only the standard gauge from Scranton to Albany.

Long Island Railroad.

This company has scarcely settled its disagreement with the people of Jamaica before it is involved in another, which the New York *Herald* thus describes:

"Six months ago the Rockaway branch of the Long Island Railroad was commenced. Mr. O'Donohue, of Rockaway, remonstrated against having it extended through his farm, but while from home one day the contractors assembled their entire force and graded the route and laid the track. The route as now surveyed runs through several cottage premises, to which the occupants object. Among them is Horace F. Clark, who owns a handsome villa and several acres of ground, for which he refused \$500,000. He has informed Mr. Charlick that he will make every opposition that money can accomplish. Others coincide with Mr. Clark, and a lively contention is possible. Mr. Charlick is determined not to change the route."

Atco & Glassboro.

Engineers are surveying a route from Atco, on the Camden & Atlantic Railroad 19 miles southeast of Camden, N. J., southwestward 13 miles to Williams-town, and thence about 12 miles west to Glassboro, on the West Jersey Railroad 17 miles south of Camden. It is hoped to have it completed by next February.

Mayaville & Lexington.

This new Kentucky railroad is now completed from Mayaville, on the Ohio, southwestward about twenty miles.

Springfield & Athol.

This railroad, chartered by the last Massachusetts Legislature, will extend from Chicopee Falls (at the terminus of a little branch of the Connecticut River Railroad five miles north of Springfield) northeastward through Indian Orchard, Jenkstown, and Ludlow Center to Barrett's Station, in the town of Belchertown, where it will connect with the Athol & Enfield Railroad, now nearly completed to Athol, whence a line to be built will extend through Winchendon, Peterboro and Hillsboro to Concord, N. H. Thus a new and very direct line will be formed between Concord and Springfield.

Newark & Paterson.

A contract has been made with the Erie Company to complete this railroad from Newark to the Bergen Tunnel by the 1st of May next.

Atlantic & Great Western.

It is reported a new railroad from the oil regions will be constructed under the auspices of this company from Tidioute by way of Titusville and Cambridge to Erie.

Richmond & Danville.

On the 31st ultimo the sale to the Richmond & Danville Railroad Company of the State's interest in the road was consummated. The total amount owned by the State was \$1,034,924. Of this amount \$100,000 was paid some months since; the balance (\$934,924) was paid on Thursday, and the stock transferred to the company. The three directors who represented the State were Messrs W. T. Sutherland, W. L. Owen and Hunter H. Marshall, who were re-elected.—*Richmond Dispatch*.

Catskill & Schoharie.

A company has been incorporated in New York to construct a railroad from Catskill (on the Hudson, about 35 miles below Albany) northwestward through Albany County to Central Bridge, Schoharie County, where the Albany & Susquehanna Railroad crosses Schoharie Creek. It is to follow the grade of the old Catskill & Canajoharie Railroad, the second built in New York, but long ago abandoned. The line is about 40 miles long.

Central of New Jersey.

This company is constructing a third track between Jersey City and Somerville, 36 miles, to be used entirely for freight trains.

Lackawanna & Susquehanna.

We learn from an exchange that it was expected that this railroad would be completed from Nineveh, N. Y., south to Lanesboro, Pa., by the 15th inst. This is the Delaware & Hudson Canal Company's new railroad, or rather a branch of the Albany & Susquehanna Railroad. It will be used exclusively for the transportation of coal, and will shorten the route from the Susquehanna River to Albany 26 miles. The grade will be 57 feet less to the mile than on the present line, thus saving 40 cent. per ton in transportation. Trains leave the mines at Carbondale on the Jefferson Railroad, which runs to Lanesboro. The branch will cross the Susquehanna River at Harpersville by a bridge 450 feet long, and will follow the east bank of the river to the mouth of Starucca Creek. Leaving the river it will cross the creek directly under the Erie Railway Viaduct, and 60 feet below the Erie track. The junction with the Jefferson road will be made two miles above the viaduct. The distance by this route between Carbondale and Nineveh will be 57 miles. Rails weighing 63 pounds to the yard are used.

Rock Island Bridge.

The work of erecting the iron superstructure of the new railroad and wagon bridge over the Mississippi at Rock Island commenced on the 10th inst., with the first span on the Iowa side. The bridge will consist of seven spans, with a total length, including draw spans, of 1,547 feet. About a month will be consumed in building each span. The work on the last pier is now so far progressed as to be out of danger from water.

Wisconsin Central.

Last week a contract was let for the grading, masonry, bridging and ties of this railroad from Stevens' Point, 40 miles westward, to be completed by the 1st of November, to Harper, Boyle & Seymour, whose headquarters are now at Stevens' Point. Of this firm Mr. H. S. Boyle is from La Crosse, and Mr. Seymour, of Chicago.

Lawrenceville & Evergreen.

Under this name a company was organized recently at Pittsburgh, to construct a short railroad for suburban traffic. Matthew Cridge is President, and Charles A. Colton, Treasurer.

Jefferson Railroad.

A passenger train now runs daily over the new Jefferson Railroad from Susquehanna Depot, on the Erie, to Scranton, via the Delaware & Hudson Canal Company's new locomotive road. The day express engines on the Erie make 40 and even 50 miles an hour over the Susquehanna Division, with very heavy trains. The old engines employed when trains were smaller now run the accommodation and mixed trains. Swift passenger locomotives now take 12 or 13 coaches over the Susquehanna Summit without aid from "pushers." Six hundred men are employed in the Erie shops at Susquehanna Depot, in connection with which is a commodious reading room with a library of 1,200 volumes used by the employees.—*New York Tribune*.

Lehigh & Eastern.

The project of building a railroad from the Luzerne coal regions to the Hudson River, to connect with Eastern roads, is now assuming a tangible form. A company has been formed, known as the Lehigh & Eastern Railroad Company, and a board of officers and directors elected. The President is S. P. Kase, of Danville, Pa.; and among the directors are Homer Ramsdell, of Newburgh; the Hon. C. Burnett, of Stroudsburg, Pa., and the Hon. Harry White, of Indiana, Pa. The line of the road will be from Hazleton to Wilkesbarre, and thence an air line to Port Jervis, N. Y., through Ulster County to Fishkill. This will bring Boston in direct connection with the coal regions.—*New York Tribune*.

Pennsylvania Railroad.

This great company, according to the Philadelphia *Bulletin*, is about to undertake the construction of the Pennsylvania & Delaware Railroad which will extend from Pomeroy, 37 miles from Philadelphia, on the Pennsylvania Railroad, southward 21 miles to Landenberg, near the Delaware line. A part of the work is done, and it is intended to have it completed by February.

The Columbia (S. C.) *Phoenix* says that the Pennsylvania Railroad Company has purchased 1,200 shares in the Charlotte, Columbia & Augusta Railroad, raising the interest of the Pennsylvania Company, according to the same authority, to 10,000 shares, or nearly a controlling interest in the company. This, it is supposed, will give it nearly complete control of a line from Baltimore to Augusta, Ga.

Winona & St. Peter.

The St. Peter (Minn.) *Tribune* of September 6 says: "Since the commencement of work on the extension of the Winona & St. Peter road, west of this place, it has been pushed so vigorously that already the grading is pretty nearly done to the second crossing of the Minnesota River, at Redstone, some three or four miles this side of New Ulm. In two weeks track-laying will probably be commenced and continued until it reaches Redstone."

McGregor & Southwestern.

Articles of incorporation have been filed for a company which proposes to construct a railroad from McGregor, Iowa, southwestward to Kansas City, Mo.

MECHANICS AND ENGINEERING.**A Wooden Railroad in Arkansas.**

The Arkansas *Gazette* describes a wooden railroad more than a mile long, used for hauling timber from a swamp to a saw-mill, about six miles from Little Rock. The rails are mostly of white oak, 2½ by 4 inches and 20 feet long. They have been in use about two years, and are generally in good condition. The gauge is 3½ feet; the cost, about \$750.

The Steinhard Steam Brake.

At an exhibition of the working of this brake given recently on the Flushing & North Side Railroad, in connection with an excursion, under the direction of the Superintendent of the road, we were able to gather some information concerning the construction of the brake, which may be interesting:

The trial was made in the presence of a large number of railroad men, all of whom expressed themselves much pleased with the performance. A straight piece of track was chosen, consisting of a grade terminating in a level. The train, comprising a locomotive, tender, and seven empty passenger cars, ran down the grade, and at a designated point on the level track the brake was applied. In the first of two trials, the speed of the train being estimated at 25 miles per hour, a stoppage was made in 25 seconds, and in the length of the train, or about 400 feet. At the second trial, with a speed of from 30 to 35 miles per hour, the train was brought to a stand in 30 seconds, and in a distance of 800 feet.

The brake was used for making stops throughout the trip, and the smoothness with which they were made was especially noticeable, there being no jerking or shock.

The Superintendent said that for the five months during which the brake had been used on the road, not five dollars had been spent for repairs on it.

The brake, in brief, consists of a steam cylinder, whose piston acts through a system of rods and levers upon the various brake-rods of each car, and may be considered as consisting essentially of two parts.

The first part or steam cylinder (14 inches diameter and 12 inches throw) is located directly under the foot-

board, the piston-rod projecting forward and hinged to the middle of an in-lined lever, one end of which is pivoted to the engine and the other to a long rod extending back to the first car. A graduated safety-valve allows the pressure in the cylinder to be modified to any degree up to boiler pressure, and in accordance with the number of cars used on the train. A pipe leading to the boiler, with a cock under command of the engineer, admits the steam to the cylinder.

The second part of the apparatus consists, first, of a vertical frame attached to the underside of the car midway between the trucks. Two pairs of grooved pulleys are set, one above the other, in the frame; and the rods coming from the brake levers on the trucks are joined together with a chain which lies on top of the upper pair of pulleys. A fifth pulley stands on top of the chain midway between the points of contact of the just-mentioned upper pair, and when the brake is applied the single pulley is pulled downward by its attached stirrups and chain—this chain going between the lower pair of pulleys and fastening to a longitudinal bar sliding in guides of the frame above mentioned. The bar carries at each end a lever pivoted to it at their centers. One end of each lever connects with the end of another lever (whose center is fixed under the platform of the car) and whose other end connects by a short link to the Miller buffer here used. The other end of the lever on the sliding bar is joined to the rod coming from the corresponding lever on the next car, or in the case of the first car the lever on the forward end of the sliding-bar connects with the long rod from the engine. It will thus be seen that, when the buffers move outward owing to increased draft, the rods and levers move so as to compensate for the difference in the length of the train, and all discrepancies are equalized.

The working of the brake was satisfactory, and its simplicity and non-liability to get out of order, together with its small first cost, are merits which it seems to possess in a greater degree than any other kind of power-brake yet introduced.

The inventor claims that with a larger cylinder than that used, the results would have been much more satisfactory, and that with a lighter train (for which this cylinder was intended) they had been often in the habit of stopping in from ten to fifteen seconds.

We hope before long to give a fuller account and description of this apparatus.

Wooden Railroad in Canada.

A wooden railway on the 4-foot 8½-inch gauge is being constructed from the town of Sorel, at the confluence at the Richelieu River with the St. Lawrence, through Drummondville, to Arthabaska, Province of Quebec, by Mr. L. A. Senecal, contractor. The Montreal *Herald* gives a long account of a recent trip on the line. Upwards of 2,000 men were at work, and the rails are laid on a large portion of the road. An experimental trip was made, the train going at the rate of twenty-five miles per hour, and running with remarkable smoothness. The journal quoted furnishes the following particulars: "The ties, which are of hemlock and tamarac, are now brought down on trucks from the woods through which the railway runs; they are put on a rollway, run up to most ingenious circular saws, so gauged that at one operation they are morticed the proper depth and distance, not the difference of a hair breadth being found between one and another. As fast as they are cut, and the operation is very fast indeed, the prepared ties are rolled over to a different siding from that on which they are received, an ordinary circular saw sides them, and they are loaded up to be run out to the place where they are wanted. The wedges for laying up the rails are also prepared here. The rails are of maple, four by seven inches and fourteen feet long, the gauge of the line being 4 feet 8½ inches. The cost of the line, in which cost are included stations (nine in number), car and locomotive depot, engine and repairing shops, engine and tender, two passenger cars, eight grain cars, and twenty-five wood cars, is \$5,000 a mile, in full for all but the Yamaska Bridge, which cost \$35,000. It should be mentioned that land damages, fences, etc., are included also in this amount."

Prevention of Railroad Accidents.

From the government report on railroad accidents in Great Britain during the year 1870 made to the Board of Trade by their inspecting officer, Captain Tyler, we take the following "general summary," which, though not applicable in all particulars to our American railroads, will be found very suggestive:

On a general review of these 123 train accidents, it would appear that the principal causes have contributed or combined to bring them about in the following proportions:—Fractures of couplings 4, defective maintenance 9, defective construction 12, defective accommodation for traffic 6, insufficient, or inexperienced staff, or too long hours of duty 12, insufficient brake power 10, defective signal and point arrangements 60, want of means of ascertaining correct time 2, want of improved regulations, or defective discipline 27, want of telegraph communication, or of system for securing intervals of space between trains 43, want of care of officers or servants 88, excessive speed with reference to conditions of road or rolling stock 2, foggy weather 17, improper interference by persons not under control of the companies 2. None of these accidents can properly be classed as "purely accidental," inasmuch as they are all of a nature to be avoided by extra means and appliances, or by care and fore-thought, and accidents from all of the above causes are more or less preventable, except in so far as it will never be possible, under the best arrangements, altogether to avoid accidents from neglect or mistakes on the part of employees, although it is practicable, under good arrangements and systems, and with good discipline, very much to reduce their number. These causes may

again be reduced in number. Neither the delays, nor the other risks attendant on the fractures of couplings, would, for instance, necessarily cause accidents under good conditions of working,—as regards intervals of space between trains, proper precautions on or near steep gradients, siding accommodation for conducting the operations of goods traffic independently of the main lines, and sufficient brake power. Defects of maintenance are to be guarded against, partly by proper supply of suitable materials, and partly by superior discipline. Although there is greater risk in foggy weather, and dense fog is one of the greatest difficulties that is encountered in the conduct of railway traffic, yet that risk is much diminished when proper appliances for working are provided; and it would be still further reduced as I have pointed out, in the summary, class D, by strict orders and more rigid discipline in the matter of speed, combined with ample brake-power and the free use of detonating signals. The various mechanical means that have been proposed from time to time, and sometimes tried experimentally, for placing fog-signals on the rails, or operating upon steam whistles, or otherwise giving additional notice to the engine drivers, have none of them been brought as yet into successful practice; and there would always be risk in trusting any expedients of this description which were employed exceptionally, and were not required for every-day work.

Brake power.—As regards brake-power much has to be done. On certain railways, where the gradients are steep, or the stoppages frequent; or, in other words, where the necessities or convenience of the companies have been the means of inducing more rapid improvements in this respect, systems of continuous brakes have for many years been in successful operation; and the experience of these lines has left no doubt of the value of such system of brakes. But on many, and on some of the larger lines, more ingenuity has been displayed in finding objections than in overcoming them. Among the simpler means of providing extra brake-power are (1) increasing the numbers of guards and of brake vehicles; (2) enabling, as on some railways on the continent, a guard or brakeman to apply the brakes of two adjacent vehicles; (3) allowing, as in America, the guards and brakemen to walk through the trains, and to apply the brakes of the various vehicles—every car being supplied with a brake. But by the systems of Messrs. Newall, Fay, Clark, and others, in this country, a guard may from his van apply the brakes of several vehicles, and certain advantages of economy in guards with efficiency of brake-power are thus combined. In the use of any good system of this description, it becomes unnecessary to skid the wheels of brake vehicles, and flat places in the wheel tires are thus avoided. It should, however, be possible, in a perfect system of continuous brakes, for an engine-driver, or a guard (or for either of the guards, where there is more than one in a train), to apply the brakes in a case of emergency; and the brakes should, if worked by manual labor, be so constructed as to require force—not to apply them, but to release them. Under the existing system, as ordinarily applied, it is frequently found, on the occasion of accident, that a guard has omitted to apply even the small proportion of brake-power at his disposal, in consequence of his not having heard the whistle from the engine. In some, though rarer cases, the guard sees danger before the engine-driver, but is unable to communicate with him.

Employment, Hours, and Discipline of Servants.—As regards the employment of servants, and length of hours of work, the ordinary rule for signalmen at day and night posts is 12 hours on and 12 hours off, while in certain exceptional cases the 24 hours of duty are divided between three men. Eight hours of continuous duty at very busy signal-cabins, and 12 hours in any signal-cabin, are sufficient; but periods of 18, 25, and even 37 hours, for which men have been found to be regularly or periodically employed, principally during exchange of duty, once in two, seven, or 18 weeks, are inexcusable. When, in the reliefs of the men between day and night duty, or between different posts, these excessive periods of duty are permitted, or winked at, the difficulty arises chiefly from the want of a sufficient number of relieving men. As complications of traffic increase, and the men require more and more to be trained and educated to their work, so also it becomes necessary to keep up a good staff of relieving men, ready to undertake duty in any cabin in a case of emergency, from sickness or otherwise, and available for Sunday duty, so as to give the regular signalman a holiday in place of extra hours of duty on that day. It is by good arrangements of this description combined with proper appliances, carefully devised systems of working, and strict discipline, that negligence, want of care, and mistakes of servants may, in a great measure, be avoided. And here it may be observed that there is too much tendency in railway working to allow irregularities to proceed unchecked until an accident occurs to draw special attention to them, whereas safety is so far dependent upon constant watchfulness in this respect that it may be laid down as an axiom, that far more security is obtained under an inferior system with good discipline, than under the best of systems without discipline. In cases in which the means and appliances are wanting to enable men to comply with printed regulations—as, for instance, when their printed regulations enjoin them not to allow a main line to be obstructed at a station within ten minutes of a passenger train being due; and a goods train arrives, and there is no siding in which to place it off the main line, while an express passenger train is perhaps due or over due in each direction, then the officers and servants at the station are obliged to disobey their printed regulations. In this manner lax systems of working are induced. When permitted practices and printed regulations are thus necessarily at variance, as is too frequently the case, then discipline cannot possibly be maintained.

Unpunctuality.—Unpunctuality has not been here referred to as a cause of accident, although it was

noticed in many of the cases of collision enumerated. Punctuality is partly a question of sufficient engineering, of staff, and of other means, and partly a question of discipline; and both of these matters are of great importance, as contributing to the proper working of a railway, and the convenience of the public. But unpunctuality ought, nevertheless, not to be a cause of accident. A certain amount of irregular working is necessary on every railway, and most of all on the busiest lines, where special engines or trains, sometimes in connection with steamboats, and trains otherwise out of their regular course, must be run, and must be provided for. If railways are not adapted for irregular and unpunctual as well as for time-table working, then the highest degree of safety is not obtained, and every little irregularity will be an occasion of risk. When an accident occurs as a consequence of unpunctuality, it is proved rather that the mode of working requires amendment to prevent such risk from irregularity, than that the risk ought to be avoided by the vain endeavor to avoid accident by means of perfect punctuality. In fact, unpunctuality ought not to be even an excuse for, much less a cause of, accident; and a railway that is so worked as to be safe only for punctual trains only, cannot be considered safe for ordinary railway traffic.

Other Causes.—Looking to the other causes of accident, it would appear, as regards the permanent way and works, that next in importance to proper maintenance, and even as part of it, is the question of discipline among those employed in repairs, with a view to insure, as far as possible, that due warning shall be given to the engine-drivers when a rail has to be taken out, while the road is being lifted, or when the line is not in a fit condition to be run over at speed. And as regards the rolling stock—the careful maintenance of locomotive boilers, which should be repaired, renewed, or rejected, while there is still a large margin of strength and durability beyond the risk of actual explosion; the good design, construction, and quality of axles; and the adoption of secure fastenings for the tires of wheels, or of wheels from which tires cannot fly—are, on the question of safety, the chief points to which attention is required.

Accommodation and Relief Sidings for Goods Traffic.—But the means and appliances required for the prevention of accidents at facing points, on inclines, and at junctions, and of collisions in general, are, as measured by loss of life and injury, as well as by the number of the accidents, of very much greater importance. And these means and appliances require, as I have shown in the summaries of the various classes of accidents, to be applied and employed in combination with one another. It would be impossible, and it is not necessary, to satisfy, to a limited extent, the cry which has most naturally been raised in connection with recent accidents, of separate lines of rails throughout the country for goods and passenger traffic. But it is practicable and necessary to provide accommodation sidings in suitable localities, in which goods trains may take refuge from passenger trains; and for the want of which the officers and servants of the companies are placed in continual difficulties, and are frequently compelled, in shunting a good train out of the way of one passenger train, to place it in the way of another. It is practicable and most desirable, and especially on steep gradients, to provide independent sidings, in which goods trains shall be marshaled, and which the shunting of goods traffic, the sorting, the attaching, and the detaching of wagons shall be conveniently performed without obstructions or risk to the passenger trains. It is possible and desirable to improve signal and point arrangements, so as mechanically (by locking apparatus) to prevent the mistakes so often made by signalmen with conflicting signals or with facing points; and mechanically (by catch-points) to prevent engine-drivers of goods trains from leaving sidings and fouling passenger lines, except when they receive formal permission to do so. Without such arrangements, which are more particularly referred to in the summary, class I, the best men will sooner or later make mistakes or be guilty of negligence; and by the aid of them—the possibility of such mistakes being reduced to a minimum, a surprising degree of safety may be obtained. As an instance of this, among many which might be quoted, I have shown in Appendix No. 5, the traffic for a single day, and at certain hours of that day, at the Cannon-street station of the Southeastern Railway—already referred to as one of the no-accident lines of the year. The traffic of that station, with trains continually crossing one another, by daylight and in darkness, in fog or sunshine, amounts, as will be seen, to more than 180 trains in three hours in the morning, and a similar number in the evening; and, altogether, to 652 trains, conveying more than 35,000 passengers in the day as a winter, or 40,000 passengers a day as a summer average. It is probably not too much to say, that without the signal and point arrangements which have been supplied, and the system of interlocking which has been so carefully carried out, the signalmen could not carry on their duties for one hour without accident. In this case there are as many as 67 levers for working points and signals in one cabin, and the apparatus is of the most complicated description. On the other hand, 5 persons were killed and 59 injured, at Brockley Whins, solely from the want of similar apparatus of a simpler kind.

Telegraph and Block Systems.—It is again very possible and desirable, in combination with these improvements, to extend the use of the telegraph in giving information of the approach of trains, and in securing intervals of space, in place of trusting to illusory intervals of time, between following trains; and to apply the same system for the protection of standing, or shunting, as well as of running trains. The advantage of doing so is shown daily on the Metropolitan lines, and on other lines of crowded traffic, which could not be worked safely for a day without such a system. The want of it has been illustrated by many of the accidents above enumerated; and the principal lessons to be

derived from the accidents which have occurred under different block systems are, that the main principle of space intervals between trains should be carried out more thoroughly, more carefully, under a good system, with good apparatus, with well selected servants, and under good discipline. As instances of the actual cost of introducing and maintaining block telegraph systems, the cases of three railways may be cited, working under different circumstances: On the London & Southwestern Railway, £20,000 has been expended on 160 miles (as capital expenditure) for this purpose, and two extra signalmen are employed at each telegraph station, at wages, etc., of 25s per week each on the average, besides the cost of maintaining the wires and instruments, etc. There is thus a total cost of £125 per mile of first outlay, and, say, half as much per mile per annum of subsequent revenue expenditure. On the London, Chatham & Dover Railway, the metropolitan lines, for 17 miles (partly for two, partly for three, and partly for four lines of rails), are worked on a more expensive system, with needle-telegraph block instruments; while the main line and branches below Penge, where there are only two lines of rails, and where the traffic is lighter, for 116 miles, are worked, except at three tunnels, on a cheaper bell system. The estimated cost of the train signaling system on the metropolitan lines is £2,961, or £174 per mile; and on the main line and branches £4,173, or £36 per mile. And the annual expense of maintenance and working is, on the metropolitan lines (on a careful calculation) £1,035, or £61 per mile, and on the main line and branches £785, or between £7 and £8 per mile. On the Midland Railway, the additional expense incurred for construction, maintenance, and working of 50 miles of double line between London and Bedford on the block telegraph system, as compared with the same portion of line worked without that system, has been found to be, in construction £2,641 11s, and in maintenance and working £1,452 11s, or at the rate per mile of £52 16 7d for construction, and, per mile per annum, of £29 1s for maintenance and working. Expenses of this description will usually be heavier in the case of lines where the traffic is also heavy, and where this extra means of safety is therefore the more urgently required; and from the actual cost of construction and maintenance must be deducted, when the system is properly carried out, a not inconsiderable proportion on account of accidents avoided, compensation payments saved, and of damage to freight and rolling stock diminished.

Remedies Required.—The principal remedies which are now required for the prevention of accidents on railways may, therefore, be summed up as follows: 1. Judicial selection, careful training, strict supervision, rigid discipline, and moderate hours of duty of employees, and especially of those on whom safety principally depends. 2. Careful maintenance, in high condition, and ample warning to engine-drivers during repairs of the permanent way. 3. Careful design, construction, and good material of axles. 4. Improved fastening of tires, to prevent the possibility of their flying off the wheels in the event of fracture. 5. Improvement of coupling arrangements. 6. Careful construction and maintenance of, and testing when repairs are effected, as tending to insure a greater margin of strength and safety in locomotive boilers. 7. Improvement of signal and point arrangements, with concentration and interlocking of signal and point levers in suitable cabins, and safety-points to protect passenger lines from goods sidings. 8. Increased use of the telegraph, and its application to every railway station. 9. Further application of the principle of securing intervals of space in place of intervals of time only between trains and engines. 10. General increase of accommodation and appliances from time to time with increase of traffic. 11. Accommodation sidings, in convenient localities, for goods trains, that they may not unnecessarily encumber the passenger lines. 12. Independent sidings in which to marshal the goods trains, to perform shunting, and to exchange goods wagons, otherwise than on the passenger lines. 13. Ample brake power, to admit of trains being brought to a stand within reasonable distances in all cases of emergency. 14. Precautions on steep inclines—of conducting the operations of goods traffic independently of the passenger lines, and the application of safety points interlocked with signals to goods sidings, so as to protect the passenger traffic. 15. Reduction of speed in proportion to the state of the atmosphere, and the conditions of the traffic—in foggy weather. Many of these remedies involve improvements which have been gradually worked out and brought to comparative perfection within the last 10 or 15 years; and it is quite true, and only fair toward the railway companies to bear in mind, that, looking at railway management from a practical point of view, it is impossible that every new invention or improvement can, as soon as its efficiency has been tested, or its merits proved, be at once adopted and brought into general use. Alterations of permanent way, or of rolling stock can only be carried out by degrees; and improvements of system and working must also in many cases be gradually introduced. Differences of opinion may also exist as to what is right and desirable, or the contrary, on railway as well as on other subjects; and the theory, at all events, of railway investments is that the proprietors of stocks and shares should derive pecuniary profit from railway construction and working. But making full allowance for all these considerations, it is impossible to overlook the fact that improvement on railways in this country has not progressed in some respects as fast as it ought to have done; or to assert that either the proprietors of the railways, or those who use them, have obtained or are receiving, in return for the expenditure of such enormous sums of money, all the profit, all the safety, or all the convenience, which they might fairly have expected. Joint stock enterprise has its failings as well as its advantages, and joint-stock management is not without its dangers and difficulties.